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TOWARD A CYBERNETIC PHENOMENOLOGY OF INSTRUCTION

by

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M. J. MAX VAN MANEN

A THESIS
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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled "Toward a Cybernetic Phenomenology of Instruction," submitted by M. J. Max van Manen in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

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ABSTRACT

In this study an attempt was made to conceive of an orientation toward the study of instructional, i.e., teaching-learning, phenomena, which is called "cybernetic phenomenology." Cybernetics is a branch of information science and allows abstraction of processes of instruction in terms of communication systems processes. Phenomenology is a methodology for the investigation of phenomena of experience. In a complementary relationship the products of instructional cybernetics lend a thematic interest to the application of the phenomenological method in the study of selected teaching-learning phenomena.

It was noted in this study that many leading educators have chosen to adopt a naturalistic attitude in scientific research of instruction. These educators believe that only the model of science "as it is being used in the physical sciences" can create order "out of the morass of modern curricular and instructional innovations of every cast and variety." This study examined the implications of such a position which sees the aim of science as situated in the formulation of theories. Next it examined the nature and the potential scope of instructional theories and investigated the state of nature of some specific instructional theories as they have been put forward.

Cybernetics provides a comprehensive systems interpretation of teaching-learning relations which underlies much current theorizing in the area of instruction. Instruction was seen as a system operating on a higher level of homeostasis than do either teaching or learning as separate systems. Cybernetics presents an interpretative discourse which is being explored by developmental psychologists, learning theorists and researchers on teaching. However, human information processing systems are quite different from the artificial ones. Moreover, a teacher tends to be concerned with experiential problems rather than with the more abstract phenomena of applied theoretical science.

A comparison was made of the implications of a phenomenological orientation and the orientation of cybernetics. The thesis was presented that cybernetic phenomenology may be conceived as an experience-orientated methodology in the study of teaching-learning. In terms of cybernetic phenomenology an attempt was made to give a direct description of our experience of the teaching-learning situation as it is, without taking account of the causal explanations and theoretical origin which the instructional scientist may be able to provide. It was pointed out that instructional cybernetics constitutes the domain within which the investigator selects a phenomenon to which the phenomenological method is then applied. Details of the method were presented and selectively applied to the phenomenon of orientation.

It was postulated that "good" novels form one source among many for the application of cybernetic phenomenology. Carlos Castaneda's anthropological study *Journey to Ixtlan* was selected as such a source for the examination of the relational phenomenon the "Sorcerer's Apprentice." Although this very limited resource imposes a restricted use on the method, a modest analysis of the teaching-learning phenomenon "Sorcerer's Apprentice" was attempted.

ACKNOWLEDGEMENTS

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Chapter I

THE NATURE OF THE STUDY

The Problem

In this study two fundamental orientations towards the study of instructional phenomena will be examined: the theoretical and the existential. The methodologies employed are those of cybernetics and phenomenology. It is the thesis of this study that each orientation has its inherent strengths and its limitations. By adopting an orientation which I shall call 'cybernetic phenomenology' some of the limitations of the methodology of one will be complemented by the other. Cybernetic phenomenology as an orientation may provide educators with a methodological tool for practical use in instructional situations. And as a mode of inquiry cybernetic phenomenology could serve as a research methodology for producing valuable knowledge for fundamental insight into the phenomena of instructional reality.

An attempt shall be made to support this thesis by considering 1) the nature of the science of instruction (Chapter III), 2) a cybernetic view of instruction (Chapter IV), 3) a comparison of two orientations: phenomenology and cybernetics (Chapter V), 4) the epistemology of cybernetic phenomenology (Chapter VI), and 5) a case study: "the Sorcerer's Apprentice" (Chapter VII).

The overriding questions that provided guidance to this research may be formulated as follows:

(1) How does instruction appear when viewed from a perspective of cybernetic systems thinking?

(2) How does instruction appear under the constraints of a naturalistic methodology underlying cybernetic theory? A corollary of this question is: In what direction is the study of instruction, based on the orientation of theoretical science, heading?

(3) How does cybernetics as a science compare with the phenomenological orientation?

(4) How does instruction appear when viewed from a radical empiricist, i.e., a phenomenological, point of view?

(5) Could cybernetics and phenomenology enter a partnership in the study of instructional phenomena?

(6) If so, what is cybernetic phenomenology?

(7) What would a case study based on this orientation look like?

(8) What is the conclusion of this exploratory project?

(9) What type of studies, if any, could be recommended from here?

Procedural Notes

The rationale and format of this study should be viewed as a form of exploratory research. The value of this thesis study lies not primarily in its final product, as it is materialized in these pages. Rather, the pay-off must be assessed in terms of the nature of the exploration itself. This exploration is the first groping for the development of an orientation which may actually take a lifetime to bring to some sort of satisfactory conclusion. Thus, this thesis is not intended to be the end but rather the beginning of a commitment to the study of instruction.

Inconsistencies in the text of the study can be traced back to the shifts in orientation I experienced during the course of the exploratory project. For example, after initially being quite enthusiastic about the heuristic properties of the isomorphs between theories of cybernetics and theories of instruction, I became gradually impressed by the fact that the cybernetic approach, as a branch of the theoretical science of communication, is incapable of doing justice to the reality of instruction as a 'lived reality.' And furthermore, I realized that this inability is an epistemological consequence of the objectifying attitude. "Objectivization distorts," says Maruyama, "not necessarily because of what it measures but because of what it does not measure, and because the measurables must be interpreted in the context of the unmeasurables."[1]

If 'the experiential' cannot be measured in the traditional scientific sense, then what 'experience-oriented methodology' can be resorted to in order to 'invade systematically' the realm of lived experience? This question is a reconstructed one. I had been accepted as a candidate towards a Ph.D. in social education, partly on the basis of a thesis proposal which asked for support to explore the possibility of conceptualizing a theory of instruction based on a concept of communication. My preliminary reading list included not only authors from the general area of communications and systems thinking, but also the various publications of Karl Pribram, neuro-psychologist (and his associates), whose theorizing on the functioning of the brain and likening it to the homeostat, brought him very close to the deterministic mechanistic model of Ross Ashby's fascinating concept of *Design for a Brain*. It seemed to me at that time that researchers such as Joseph Scandura were on the right track in striving toward a deterministic, that is, a 'predictive' theory of instruction.

---

[1] Magoroh Maruyama, "Paradigmatology and its Application to Cross-Disciplinary, Cross-Professional and Cross-Cultural Communication," (Unpublished Paper, 1973), p. 55.

It was at this point that I started to inquire further into the epistemological aspects of the 'theoretical attitude.' What really does it mean to attempt to 'explain,' 'predict' and to 'control' genuine teaching-learning events? I started to look more critically at so-called (scientific) 'theories of instruction' as they have been proposed by a significant group of eminent educators.

I gradually became convinced that the entire project of searching for teaching-learning theory relevant to the 'real' classroom was, partly at least, a self-defeating endeavor. Although educators such as David Merrill have a very 'practical' interest in the area of instructional design, it is clear that the more they attempt to 'tidy up' the theoretical frame, the further they remove themselves from the untidy hustle and bustle of teaching-learning as it actually occurs in the experiential life-world of teachers and students. I corresponded about this problem with Dr. Joseph Scandura whose answers could not satisfy me.

Thus, I became exceedingly doubtful about the usefulness of the scientific paradigm in studying the reality of instruction. Frustration crept into my feelings about the nature and the direction of my thesis project. How could I further pursue an idea in which I had started to lose confidence?

It was at this point of heightened frustration that I happened to read Carlos Castaneda's works. In fact, thinking back to my encounter with Castaneda, I dare say now that it was somewhat of a 'cathartic' experience. Castaneda had found an ideal reader. With a thesis on my mind that seemed to have lost its initial impetus, I was frustrated and plagued by a high level of cognitive uncertainty. Dwelling upon my own experiences, I now more fully appreciate how the generic property of frustration may elicit new ideas in the learner. Some of the best teaching-learning situations happen where and when they are least expected. And when they do take place, reflection on these experiences must impress educators with the fundamental complexity of contingent factors.

It was Sunday evening and my instructional environment did include materials or 'things' rather than a 'live' teacher. I was comfortably sitting at home, reading a book while listening to some new records and sipping from a glass. It was indeed an ideal instructional setting! The material I was reading was the second part of Castaneda's anthropological study on the use of medicinal plants among Yaqui Indians of Mexico.[2] A complete description of the 'instructional situation' probably would include some details of the climate and general environment of my living room, the nature of the stereophonic music I was listening to and the 'mix' of the drink I was having. The point is that a significant instructional environment may include more than what is commonly found in a school setting: four bare walls and desks. An objective test could demonstrate that I learned much that evening. That is, the changes that occurred in the cognitive/affective make-up of this learner were quite impressive. It is not necessary to recall the various facts and anthropological particulars I learned from Castaneda's study. It is more interesting to try to get at the subtle benefits that accrued to me from this reading. Castaneda renewed my interest in anthropological methodology.

---

[2] Carlos Castaneda, *A Separate Reality* (New York: Simon and Schuster, Inc.), 1971.

Not until I tried to do some follow-up reading on the use of hallucinogenic drugs among Mexican and American Indians did I fully realize how effectively Castaneda's study had communicated the existential meaning peyote may carry in the life of a Yaqui native. Like Castaneda's study, Weston La Barre's now classical *The Peyote Cult* also has an *emic*[3] orientation. But only by reading Castaneda's and La Barre's books in succession can one acquire the peculiar appreciation that marks the profound difference between the 'radical emics' of a phenomenological ethnographic method and the more common manner of reporting that is still practiced among current exponents of *"New Ethnography."*

It is in this way that the phenomenological method began to hold a promise for me in the area of research on instruction. A few educators have shown interest in the study of teaching-learning on a less abstract and less theoretical level than the statistical researchers, the interaction-analysts, etc. L.M. Smith was the first to apply the ethnographical approach to the 'live' classroom, but, as shall be demonstrated in Chapter VI, his aim is not very different from that of the 'theory builders.' Another attempt to study the reality of the classroom has been made by Philip Jackson.[4] But his study is somewhat in the line of the textbook tradition. What is lacking in such an approach is an appropriate rationale and a new methodology.

---

[3] The ethnographic concept of 'emics' is discussed in Chapter VI.

Thus, this study sets out to explore whether or not 'cybernetic phenomenology' could be conceived as a method for studying instruction and for building new knowledge about the teaching-learning process. With this new commitment, which in itself constitutes only a stage in the total thesis project, I had managed to alleviate some of my frustrations necessary to overcome the next exploratory obstacles inherent in such an undertaking.

Additional Comments

In the chapters on phenomenology, occasional use is made of the 'first person' style in writing. The employment of this device is alien to the normal theoretic attitude which detaches the writer as a 'disinterested observer' from the substance of his presentation. In phenomenological discourse, however, the *"I"* of the predicative text does not serve the function of involving the *ego* of the writer; rather, it characterizes the peculiar style of thinking of the phenomenologist. The latter tries to achieve validity for his communications by appealing to the 'authentic mode,' and thus to strike a 'responsive chord' on a level where 'science' is not allowed to seek support for its statements.

---

[4] Philip W. Jackson, *Life in Classrooms* (New York: Holt, Rinehart and Winston, Inc.), 1968.

For reasons of perspicuity the terms 'science,' 'theory,' and 'theoretical science' have been used in this study to refer only to the physicalist or naturalistic interpretation of the terms. Further, the phrases 'theory of instruction' and 'instructional theory' have been used interchangeably, as are the phrases 'science of instruction' and 'instructional science.'

Usually the terms 'epistemology,' 'axiology,' 'ontology,' and 'metaphysics' are used to refer to theory of knowledge, theory of values, theory of being and theory of reality, respectively. In this study these terms have been used in a wider or more inclusive sense: individuals are said to be characterized by different epistemologies and axiologies, which means that they have different systems of beliefs and different systems of values or relevancies. In the same vein it is possible to speak about the human life-world in terms of multiple realities related to various modes of being-in-the-world.

Chapter II

INTRODUCTION TO A CYBERNETIC PHENOMENOLOGY OF INSTRUCTION

In this introductory chapter I wish to outline an orientation to the study of instructional reality which I shall call 'cybernetic phenomenology.' It is characterized by a dual methodological approach to instruction, employing the interpretative discourse of phenomenology within the context of a communication systems theoretic framework. This study is based on the assumption that the nature of one's understanding of instructional phenomena and events is 'biased' by the epistemology that is employed. However, the nature of this bias can be explicated by examining the underlying postulates of the orientation one adopts. This introduction is initiated by some preliminary comments which serve the purpose of articulating the need and rationale for a cybernetic phenomenological approach toward instruction. All the major points of the discourse are elaborated in more detail as topics of study in the following chapters of the dissertation.

On the Need for and the Nature of Instructional Theory

Partly as a result of the efforts of educators such as N.L. Gage[1] and Robert Travers,[2] educationists believe that classroom teachers and instruction as an area of inquiry are in vital need of relatively simple theories of instruction that would allow for unambiguous explanation and prediction in practical situations never before satisfactorily achieved. Uncertainty in explanation arises, either when too many laws, principles and rules of thumb are competing to do the job, or when there is, in fact, a total lack of explanatory principles. Thus, one is tempted to ask whether it is a lack of theory or too much theory that constitutes the problem of instruction. It is clear that the prescriptive dicta of the old Herbartian schoolmen have given way to the fluid conditions of contemporary knowledge. Yesterday's certainties have become today's uncertainties. Experts on curriculum and instruction assess the problem as follows:

---

[1] N. L. Gage, "Theories of Teaching," *Theories of Learning and Instruction*, The Sixty-third Yearbook of the National Society for the Study of Education, eds. Earnest Hilgard and Herman Richey (Chicago: The University of Chicago Press), 1964.

[2] Robert M. W. Travers, "Towards Taking the Fun out of Building a Theory of Instruction," *Contemporary Thought on Teaching*, ed. Ronald T. Hyman (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1971, pp. 110-122.

> Out of the morass of modern curricular and instructional innovations of every cast and variety, teachers and supervisors are asked to make some selective decisions. They feel at a loss in trying to make these educational decisions, because the new programs and instructional devices do not seem based on consistent undergirding theories of instruction.[3]

Almost every supposed certainty in the area of teaching-learning seems to be negated at least a dozen times in the enormous volume of writings on education.[4] The current body of instructional principles, models and theory is beset with complex and contradictory concepts and propositions. As an intricate reference system it nicely 'explains' almost any event related to teaching and learning, happening in and out of the classroom. Why did this student not learn? How to explain the ineffectiveness of a teaching strategy? The imaginative teacher (who has kept his copy of the required text on teaching-learning theory) should always be able to 'come up' with some suggestive answer. For example, consider concepts such as guided learning versus self-discovery, reward or punishment, exposition versus inquiry, meaningful or rote learning, structure facilitation versus structure inhibition, content or process learning, autonomous learning versus programmed instruction, introversion or extroversion, imitation or creativity; if one principle or concept does not explain what took place then its opposite or counter concept will do so.

---

[3] Ira J. Gordon (Chairman and ed.), *Theories of Instruction* (Association for Supervision and Curriculum Development, NEA), 1968.

[4] Compare, for example, the writings of Forshay, Wilhelms and Bruner of around 1960 with their recommendations made in papers published a decade later.

Current instructional theory is more effective at postdicting than at predicting and it explains instructional events mythically rather than scientifically. Mythical explanation involves a magical use of language. A student's behavior is being explained by applying an empty label to it. This happens when the concept to which the label refers is meaningless or when the concept fails to possess any underpinnings from some theoretical framework. If the student freely participates in a class discussion then he must be "extroverted;" if he does not do so, then it is because he is "introverted." The problem is that too many so-called theories, partial theories, models and rules of thumb have been put together. In an effort to account for all known facts of teaching and learning, "instructional theory" has been forced into a cumbersome system of conflicting principles and concepts. This is the mixture one finds in textbooks on teaching and learning, not infrequently.

Why all this conflict and ambiguity? Part of the answer probably is that textbooks endeavor to do the impossible, that is, they attempt to provide the students with a 'fundamental understanding' of the phenomena and processes of instructional reality, while such fundamental understanding requires an inherent coherence of knowledge that cannot be effected (as yet) on a detailed scale. What does it mean to have gained a 'fundamental comprehension' of instruction? Stephen Leacock threw some light on the precarious status of the nature of comprehension arrived at in the pursuit of certainty. In "Common Sense and the Universe" he told the following story:

> Science, Philosophy and Theology have nowadays all come together—at a funeral. The funeral is that of Dead Certainty. The interment is over and the three turn away together:
>
> "Incomprehensible," murmurs Theology reverently.
>
> "What was that word?" asks Science.
>
> "Incomprehensible; I often use it in my litanies."
>
> "Ah yes," murmurs Science, with almost equal reverence, "incomprehensible!"
>
> "The comprehensibility of comprehension," begins Philosophy, staring straight in front of him.
>
> "Poor fellow," says Theology, "he's wandering again; better lead him home."
>
> "I haven't the least idea where he lives," says Science.
>
> "Just below me," says Theology. "We're both above you."[5]

At the risk of misinterpreting Stephen Leacock I wish to read into this nice little parable some propositions relevant to this essay.

First, there is the acknowledgement that man has to accept the anthropomorphic origin of his belief systems. Man is both the discoverer and the maker of his reality, which is therefore a typical human reality. And even within this human reality no certainty can be had, since all knowledge about the world depends on the epistemological orientation one adopts in the pursuit of that knowledge. In physics the notion of "Maxwell's Demon" and that of "relativity" have received widely accepted meta-theoretical implications not sufficiently realized in the social sciences. Maxwell's Demon was invented in a futile effort to overthrow the second law of thermodynamics, which states (in perverted form) that no information (or energy) can be obtained from a system without altering the system in some respect. To say it differently, one cannot describe something without 'biasing' it, if only because every selection of concepts in terms of which a phenomenon is being described constitutes such a 'bias.' And the "relativity" principle reinforces the foregoing idea by pointing out that the calculated figures for the mass, velocity, and path of any object are always dependent upon the point of reference from which they are observed. Similarly, socio-psychological events, such as those of instruction, must always be studied from a particular orientation. There is no vantage point from which one can see absolutely. General semanticists such as Korzybski and also writers such as Max Black and Benjamin Lee Whorf have expressed similar ideas in different ways. Heisenberg has shown that physicists have long been concerned with how their own operations interfere with the phenomena they investigate. And social science, including instructional science, has never been free from this problem, although it pretended to be when it accepted the model of "independent observer."[6] This problem of "approach interference" has variously been described as a kind of methodological contamination of the phenomena to be studied by the instrument that is designed to be applied to those phenomena. Something related to the notion of "approach interference" is what Korzybski called "logical destiny" and "logical fate."

---

[5] Quoted from Stanley W. Angrist and Loren G. Hepler, *Order and Chaos* (New York: Basic Books, Inc., Publishers), 1967.

---

[6] Amedeo Giorgi, *Psychology as a Human Science* (New York: Harper & Row, Publishers, Inc.), 1970, p. 127.

> . . . [the idea that] all intellectual life is one vast (probably infinite) system of doctrines and doctrinal functions in the making, inherently governed by logical fate. As Professor Keyser has said: "choices differ but some choice of principles we must make . . . and when we have made it, we are at once bound by a destiny of consequences beyond the power of passion or will to control or modify; another choice of principles is but the election of another destiny." The disturbing and dangerous side of the question is that the great majority of mankind are unaware of the silent doctrines which concern them. They take labels, creations of their own rational will for objects, and objects for events as true constituents of nature, and they fight and die for them.[7]

Secondly, there is no doubt that every epistemology has a fascination for the 'unknown.' And each epistemology whether it be scientific, philosophical, or mystical shares an implicit metaphysical 'faith' that the incomprehensible can be made comprehensible. Einstein expressed this faith better than anyone when he said "the most incomprehensible thing about the world is that it is comprehensible."[8]

Finally it seems that every epistemology makes the claim that its specific orientation, its methodology and content yields a unique, if not the best view of the world possible. Indeed if it did not make such claim it would have no reason for existence. Science has an inherent telos which can be found in the conception of science as fundamentally 'rationalistic.' That is, science is guided by an ideal of reason reflected in its methodology and its logic. Scientific reality is objective reality and its telos is to be found in its epistemic orientation: science is teleological in the sense that it attempts to describe "what is," "what the world is really like." The teleological character of the scientific approach is expressed in the belief that nature can be made intelligible by employing the methodology and logic of science. The implicit assumption is that a 'rational' attitude will bring us closer to the 'real truth' of things.

---

[7] Alfred Korzybski, "Fate and Freedom," *The Language of Wisdom and Folly*, ed. Irving J. Lee (New York: Harper & Brothers Publishers), 1949, p. 348.

[8] Quoted from Theodosius Dobzhansky, *Mankind Evolving* (London: Yale University Press), 1962, 1966, p. xl.

Instruction may be seen as a reality with phenomena and events making up that reality. The question is, what is our basic stance in the study of that reality? Instructional designers and programmers making use of exacting 'measurable' or 'behavioral' instructional objectives take the implicit stance that the nature of instructional reality is such that it is in essence measurable or mathematically quantifiable. A scientist looking at teaching-learning processes as an instructional system, interprets phenomena and events on an entirely different level than does the classroom teacher or the learner himself. Alfred Schuetz pointed out that the experiential and the scientific modes of observation involve different levels. In the shift from one level to another all the conceptual schemes and all the terms of interpretation must be modified.[9] The question then becomes to what extent the categories of interpretation used by the scientist coincide with those used by the observed actor, i.e., the teacher and/or learner.

---

[9] Alfred Schuetz, "The Problem of Rationality in the Social World," *Collected Papers*, vol. II (The Hague: Martinus Nijhoff), 1970), p. 65.

It is important to examine each orientation in terms of the meaning and the scope of the view it affords. To this end, it may be worthwhile to first clarify the nature of the concept *orientation* itself.

The Significance of the Concept Orientation

The implications of the concept 'orientation' in educational research and specifically in the study of instructional phenomena have rarely been discussed. However, in the wider context of social science theory problems of orientation have been described variously as "perspectivism,"[10] "modes of directedness,"[11] "attitudinal changes and stereotype,"[12] "dogmatism versus openmindedness,"[13] "conceptual pathology and conceptual fixity."[14]

In general, orientation refers to the direction taken by somebody, that is, to a certain way of looking at the world *(Weltansschauung)*. Speaking in even broader terms the ethologist Von Uexküll advanced the notion of species specific orientations with his concepts of *Umwelt* and *Wirkwelt*. In a psychological context a person's orientation has been referred to as mainly cognitive, positively or negatively cathective, or evaluative. Furthermore, orientation provides an individual with what W. I. Thomas called "general schemes" in terms of which the individual "controls his social reality" and "defines his situation."[15] Particularly in the sociological writings of Parsons and Shills[16] problems of orientation have been explicitly related to the way in which a social actor defines his "action world." The significance of cultural orientations in terms of linguistic behavior and associated conceptual orders has been expressed by the so-called Whorf-Sapir hypothesis. And the methodological relevance of orientation (often called "approach"[17]) is a thematic concern for issues of philosophy of science. The whole of the sociology of knowledge movement may in fact be regarded as a critical methodology for investigating the epistemological problems of objectivity associated with the notion of orientation. It appears then, that either implicitly or explicitly the idea of orientation appears in a variety of theoretical contexts.

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[10] Robert Merton, *Social Theory and Social Structure* (New York: The Free Press), 1968.

[11] David Riesman, *The Lonely Crowd* (New Haven: Yale University Press), 1950.

[12] Gordon Allport, *The Nature of Personality* (Addison-Wesley), 1950.

[13] Milton Rokeach, *The Open and Closed Mind* (New York: Basic Books, Inc., Publishers), 1960.

[14] M. J. van Manen, *Concepts in the Social Studies* (Edmonton: Masters of Education Thesis, University of Alberta), 1971.

The notion of orientation becomes somewhat more problematic upon the realization that a transition from one kind of orientation to another is frequently associated with psychological strain[18] or even shock.[19] Acquiring specific orientations involves processes of socialization and acculturation of which education is an integral part. Maruyama made the observation that scientific training makes the student internalize the ready-made methodology of his field of inquiry in such a way that it comes to constitute something like a "moral principle." His academic milieu provides the student with preconceived notions of what is scientifically respectable and worthwhile. And Maruyama adds that the student "may even come to consider the methodologies of other fields of specialization to be morally inferior."[20] Cybernetic phenomenology may not find easy acceptance since it employs an orientation toward education which is characterized by a set of methodological principles and aims which are not necessarily shared by North American students of instructional phenomena.

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[15] William I. Thomas and Florian Znaniecki, "Three Types of Personality," *Theories of Society*, eds. Talcott Parsons, *et al.* (New York: The Free Press), 1965.

[16] Talcott Parsons and Edward A. Shills (eds.). *Toward a General Theory of Action* (New York: Harper & Row, Publishers), 1962.

[17] Carlo L. Lastrucci, *The Scientific Approach* (Cambridge, Mass.: Schenkman Publishing Co., Inc.), 1963, 1967.

[18] Magoroh Maruyama and James A. Dator (eds.). *Human Futuristics* (Honolulu, Hawaii: University of Hawaii), 1971.

[19] Alfred Toffler, *Future Shock* (New York: Random House), 1970.

Underlying every orientation is a definite epistemology, axiology and ontology, i.e., a person's orientation is composed of what he believes to be true, to be valuable, and to be real. That means that change with respect to a specific orientation may involve a rather drastic change in any of these three dimensions. An orientation has the uncanny quality of encapsulating the person who has learned to adopt it. As soon as a student enters a certain realm of thought, be it scientism or Zen, he has to make the rules of this realm his own; and consequently, the evidences flowing from them will appear compelling to him.[21] In the context of education orientation would mean the fundamental attitude toward the phenomena of instructional reality that the educationist brings or adopts with respect to the kinds of questions he asks, the conceptual schemes he employs, his methodology and the content of the phenomena he studies. And the significance of establishing the category of orientation lies in the fact that it takes into account the instructional observer himself in the enterprise of comprehending instruction.

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[20] Magoroh Maruyama and James A. Dator, *ibid.*, p. 2.

[21] Stephan Strasser, *Phenomenology and the Human Sciences* (Pittsburch, Pa.: Duquesne University Press), 1963, p. 261.

It is difficult to determine what function is served by the models of teaching such as those proposed by Joyce and Weil[22] and the models advanced by Nuthall and Snook.[23] It seems that these authors have provided students of education with an excellent overview of the many concepts and theories of teaching as they are found in the literature. However, as a result of their eclectic nature these models of teaching are no more capable of providing fundamental insights, practical prediction and explanation than the original organizations of knowledge from which they were derived. Scientific explanation, prediction and control of instructional phenomena is *necessarily* based upon *nomothetic* theory, not simply on conceptual models of teaching. And the only epistemological orientation to instruction that is aimed at producing 'real' theory is the scientific approach. However, genuine instructional science has a methodological orientation which severely limits the scope of this approach for the study of instructional reality and which restricts the applicability of its outcomes for specific instructional situations.

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[22] Bruce Joyce and Marsha Weil, *Models of Teaching* (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1972.

[23] Graham Nuthall and Ivan Snook, "Contemporary Models of Teaching," ed. Robert M. W. Travers, *Second Handbook of research on Teaching* (Chicago: Rand McNally & Co.), 1973, pp. 47-76.

Every theory is reductive in the sense that it reduces statements about phenomena and events to a few hypothetical or theoretical constructs and postulated laws, which are usually presumed to operate on a deeper level of reality. The *effects* of laws operating can be seen but the laws themselves are not directly observable. For example, one can see "gravitation" at work from the phenomena as different as the apple falling from the branch and the tidal cycle of ebb and flood. But the concept "gravitation" remains a mysterious concept until it may become further clarified by reducing it to, for example, the notion of "mass." Similarly, examine the proposition: "Structured knowledge is taught and learnt more effectively than unstructured knowledge." This may be an instructional principle that can some day be further reduced to the structure of the neural system of the brain. Pribram, for example, has already suggested that the brain *imposes* a structure on the information it receives. Thus, psychological phenomena are explained by reducing them to physiological processes. And these may ultimately be further reduced to chemical reactions.

Thus, explanation and prediction is achieved through the process of abstraction and reduction. The point is that very few of these reductive principles have been found in the area of instruction. The kinds of things that happen in the classroom are most of the time too complex to be reduced to simpler underlying principles. Instructional science is not equipped to deal with those aspects of instruction and instructional behavior in the way they are *experienced* by us. An instructional theorist is not able 'as scientist' to elucidate the very 'essence' of an instructional situation as long as the theorist does not move outside the normative realm of the scientific methodology. Thus the instructional science talks about "instructional episodes," "inputs and outputs," "knowledge structures," "motivational behaviors," "student objectives" and so forth, without being able to ponder and reveal the essence of the objects about which it speaks. The starting point of inquiry into the essence of instruction has to be a 'real experience' concerning the human participants and things human. For this reason instructional theory 'by itself' is not likely to be of much help for the classroom teacher, the group instructor or the tutor who does not deal with 'ideal' or 'clinical' situations within which prediction and explanation is to some extent possible, but who has to deal with *particular* individuals and their *specific* problems, often immensely complicated by the reality of the entire instructional setting.

Another and related attempt to gain predictive control has been the correlational approach. It has been observed that statistical techniques have yielded a large number of hypotheses about teaching-learning which have not been of much usefulness for the practice of teaching-learning in the classroom. Even in simple maze experiments of an S - R variety there is so much variability of animal behavior that one researcher has reviewed "eighty-three factors which have been found to affect the pathway chosen by a white rat approaching a point of bifurcation in a maze."[24] And this list was not even exhaustive:

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[24] Donald Snygg, "The Need for a Phenomenological System of Psychology," ed. Alfred E. Kuenzli, *The Phenomenological Problem* (New York: Harper & Brothers), 1959, pp. 3-27.

the eighty-third factor is 'chance.' Thus, it appears that there is, as yet, not much justification for hope to count on correlational studies in the way of accurate prediction of specific teaching/learning facts in the human realm. In actual instructional situations the teacher is not dealing with simple 'facts' but with a complex flux of meaningful data from his experiences. His behavior is not so much guided by the abstract doctrines of a nomothetic theory of instruction but rather by the manner in which he interprets how the students perceive him and how they view and transact with the instructional displays. As viewed by the outside observer, the behavior of students and teachers is extremely variable. It even varies when the causal functional influences of the environment remain unchanged. In this case, it is customary to explain behavior in terms of an internal environment sometimes called "the mind" or more respectably "the neural system of the brain." The problem of epi-genetic explanations is that, at any one point in time, there are too many variables that could affect a specific course of behavior. And this makes predictions of real life events methodologically cumbersome and technically (as yet) impossible.

The point is that the teacher has to interpret student behavior (which only the student experiences) in terms of abstracted concepts of instructional theory. That is, meaningful experiences have to be translated or converted into objective facts; and these facts, in turn, are further abstracted onto the meta-level of the language of theory. A scientific theory is always an abstraction of the phenomena of our experiences. It is in the process of abstracting certain aspects of those experiences that we get facts. Instructional theory will always describe 'instructional facts' from an abstracted frame of reference. For this purpose scientific theory makes use of a meta-language. And a specific meta-language can only describe phenomena from a certain point of view, with the above discussed inherent limitations.

Every science must proceed on the assumption that all behavior (physical or social) is naturally determined; that is to say, all events have natural (causal) antecedents. And furthermore, it is generally assumed in science that nature is orderly or regular, and that all scientific corroborations are to be obtained through sensory observations, i.e., through empirical validation. Particularly as a result of this latter postulate, modern teaching-learning theory tends to be developed almost exclusively along behavioral lines. To say it differently, the predominant orientation toward instructional data is 'from the outside' rather than 'from the inside.' Not *experiences* but *behaviors* are the subject of study. Instruction viewed as the planning and realization of teaching and learning *experiences* has been criticized to the effect that *experiences* are essentially *subjective* data which cannot withstand the objectifying scientific scrutiny of 'public observation.' Consequently, instructional data are being described in terms of specifiable behavior categories which can be measured and (ideally) scaled.[25]

However, for the task of effective instructional control and of making refined predictions and explanations, presently known laws, principles, and facts of instruction are not useful enough. No theory can (as yet) be conceived which will comprehensively deal with the dazzling array of phenomena commonly occurring in the everyday transactions between the student and his instructional environment, including the entire ecology of fellow students, teachers, hardware and instructional display.

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[25] Robert M. W. Travers, *ibid.*, pp. 110-122.

So, it has been pointed out that an objectifying thematization necessarily will lead to a reductive model of instruction which is relatively poor in the sense that it is not equipped to deal with those aspects of instruction and instructional behavior in the way they are experienced by us. Besides, there is more to be 'explained' about instruction than the mere 'publicly observable.' Instructional reality as it is commonly experienced by teacher and students cannot be made the subject of inquiry by the sole means of the objectifying theories of the behavioral sciences. Especially in the substantive area of the humanities and the social sciences instructional inputs, processes and outcomes are of a modality and substance which frequently makes a mockery out of the neatness and the simplicity of an instructional design.

Introductory Notes on Cybernetic Phenomenology

Cybernetics as a branch of communication systems theory enables the educator to study instruction objectively in a systemic or scientific sense. In this approach students, teacher and display are reduced (abstracted) to behaving systems and relations among systems which can be observed, as it were 'from the outside.' Although, as it has been argued above, explanation, prediction and control on a reductive systems level is relevant for instructional reality only in a trivial way.

Nevertheless, a systems or communication theoretic orientation may conceivably produce a very basic instructional theory consisting of real scientific propositions.[26] This implies that scientific prediction and explanation on a general level is possible. The exact nature and content of such theoretic propositions is being discussed in a later section (see Chapter III).

Cybernetic phenomenology participates in a modern and very promising epistemology in that its paradigm or root metaphor is "system" or more specifically the homeostatic or self-regulating system. Phenomenology contributes as a fruitful choice in a methodological partnership for a detailed synthetic comprehension of the structure of instructional phenomena. The enormous potential of systems thinking has been demonstrated, among others (notably the General Systems Theory proponents), by Ervin Laszlo who appears to be one of the more gifted authors in this area. He applies his method of 'general systems synthesis' to an empirical interpretation of atoms as representative of physical systems, organisms for biological systems and human societies for social systems. Cybernetics, as a branch of systems thinking, is so much more appealing since it yields a consistent and coherent interpretation of instruction. Thus, it compares favorably with the many pseudo- and part-theories that are found in textbooks. An empirical systems theoretic interpretation of instruction has, therefore, great heuristic power. Without going into detail, the presentation of a few main features of this approach may illustrate this point.

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[26] The nature of theoretic propositions is discussed in the chapter on instructional science.

Ervin Laszlo[27] distinguishes four theoretical features of a natural system, which will be of assistance in the conceptualization of a cybernetic view of instruction. First there is the notion of the "systematic state property," which Laszlo defines as "a coactive relation of parts in ordered wholeness in the state of the system." Second is the "function of adaptation to environmental disturbances resulting in the re-establishment of a previous steady state in the system." This function refers to the equilibrating processes in the instructional system when the learner, for example, has been motivated to reduce cognitive uncertainty upon confrontation with an item of relevant information in his instructional environment. Thirdly, there is the "function of adaptation to environmental disturbances resulting in the reorganization of the system's state[28] involving with a high degree of probability, an overall gain in the system's negentropy and information content. It seems that this statement describes ontogenetic (evolutionary) as well as phylogenetic or epigenetic processes. Jean Piaget's principles of exploration, accommodation and assimilation are thus recast in systems terminology. And fourthly, there is the notion of a "dual functional-structural adaptation: with respect to subsystems (adaptation as a systemic whole) and suprasystems (adaptation as coacting part)." In general, this refers to the location a system occupies in the larger net of hierarchically integrated sub- and super-ordinating systems.

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[27] Ervin Laszlo, *Introduction to Systems Philosophy (Towards a New Paradigm of Contemporary Thought)* (New York: Gordon & Breach), 1972.

[28] In referring to the learning process it is better to speak of change of system's "structure."

Thus, an atom is a subsystem of a larger organizational unit, the cell; the cell, in turn, is part of an integrated whole such as the organism. Similarly, man is adapted to increasingly complex organizational structures such as the family, the club, the society, and finally his culture which is an integral part of the entire global social sphere. In the context of an instructional system it is possible, for instance, to make a distinction between a learner's internal and his outer environment with which he selectively transacts. The learner has access to information stored in his memory and information from his social or physical environment.

Adaptation is a *transactional* process in the sense that a selective exchange of information takes place between teaching and learning systems. The notion of transaction is a key term, both on the more abstract level of theory and on the concrete existential level.

Human information processing systems (i.e., teachers and learners) are continually subjected to a flow of information with which they selectively transact. There is no information that leaves an individual completely unaffected. The central maxim for a systems theory of instruction is consequently "all information is formation." One cannot communicate anything to a learner without changing him in some respect, whether this occurs through an implicit curriculum, an explicit curriculum or without the guidance of any organizational principles. Learning, or rather instruction, is an ongoing process. Actually, it may be much more useful to talk about *development* rather than speaking of *learning*. Development describes continuous epi-genetic processes instead of the neat fixed-time schedules of single learning modules or specific instructional episodes as it is often understood by educators. Learning is an ambiguous term; in a school context it is now conceived as an institutionalized process of which the end product is some sort of a commodity of a manufacturing process. For an instructional designer it is very difficult to determine, for example, what effect a certain body of organized knowledge has on a particular learner. A single piece of information, however organized, may reinforce entirely different views in two learners. The interpretation and storing of information is a very complex affair. When stored information becomes personal knowledge it is probably highly compressed and coded.[29] With respect to any individual learner it is hard to anticipate objectively the exact nature of this code. It appears, therefore, that the attempts to achieve "specific measurable objectives" is a terribly messy practice. Especially the incidental outcomes are difficult to get at.

The problem is that quantitative functional or causal relations can only be demonstrated to exist in relatively simple systems. Although Ross Ashby has convincingly argued that more complex systems are to be viewed just as deterministic as simple systems,[30] when a system becomes too complex for practical control these systems are now called "open," "dynamic," or "statistical."[31] Error in deterministic prediction and explanation of human systems is mythologically reconceptualized in terms of "autonomy," "freedom," or "creativity." It is interesting that the less predictable individual behavior becomes, the more there is a tendency to attribute this behavior to a person's "individuality" or his "creative genius."[32] Meanwhile it is clear that "miraculous" concepts such as "creative teaching," "autonomous learning" have no place in a scientific approach to instruction. In the scientific reality there are no miracles.

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[29] Robert M. W. Travers, "On the Transmission of Information to Human Receivers," eds. James B. Macdonald and Robert R. Leeper, *Theories of Instruction* (Washington, D.C.: Association for Supervision and Curriculum Development), 1965.

[30] W. Ross Ashby, *Design for a Brain* (London: Chapman & Hall Ltd.), 1960.

[31] These terms, however, have precise meanings. "Openness," for example, simply refers to the fact whether at any point in time a particular system is regarded as an isolated system (in which case the term "closed system" applies) or whether it is observed as a subsystem of a larger system (and in this case the subsystem is said to be "open").

The fact is, of course, that subjectively and inter-subjectively human actions are often perceived as "free." The individual *feels* that he possesses the freedom to make a choice among various courses of conduct; he even feels free to refrain from doing certain things as when he chooses not to act.

Cybernetics systems theory contributes a basic approach to the instructional process; however, for more refined prediction, explanation and control of instructional behavior it is not adequate. Since it employs a different mode of observation the phenomenological approach can serve the purpose of providing for a more practical type of control in concrete instructional situations. While cybernetics observes "from the outside," phenomenology employs an *empathic* technique of observation. (A fuller account of the phenomenological orientation is given elsewhere.) "Empathic perception" is a mode of inter-subjective observation[33] that has common elements with a "natural attitude" toward interpreting social reality; something Max Weber[34] referred to as *Verstehen* and Alfred Schuetz[35] elaborated as a method of observation peculiar to the meaningful world of the social sciences. It is an orientation which studies instruction from the point of view of the observed, i.e., "from the inside." Experiences are observed as experiences, not as objective facts.

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[32] B.F. Skinner, *Beyond Freedom and Dignity* (New York: Random House), 1972.

[33] Not to be confused with a "sympathetic mode" of perceiving as elucidated by Max Scheler.

As viewed cybernetically, for instance, learning is the result of the selective pressures of an instructionally functional environment. That is, the environment acts upon the learner, and induces in him observable changes in behavior. These changes can ideally be planned, predicted and measured. More specifically, the learner is seen as an ultra-stable, self-regulating system controlled by the contingencies of the information exchanges with its environment. In this epigenetic process the structure of the learning system changes which has consequences for the behavior of the learning system. In other words, the learner presumably becomes better adapted to the demands imposed on him by the problems and tasks of his environment.

Seen phenomenologically, that is from the learner's experiential viewpoint, learning is something quite different. It does not simply involve a change of behavior but rather a new awareness of a change of relationship *vis-à-vis* some relevant aspects of his social world. Learning is coming to see things with a different perspective, acquiring new feelings and increasing one's doxic confidence in the

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[illegible]E.T. Eldridge (ed.). *Max Weber: The Interpretation of Social Realit*[illegible](London: Thomas Nelson & Sons Ltd.), 1971.

[35] Alfred Schuetz, *Collected Papers*, vol. I (The Hague: Martinus Nijhoff), 1970.

ability to establish new relationships with the world. Phenomenologically "learning," "becoming" and "knowing" are viewed as modes of man's existence or, as Heidegger[36] says, modes of his "Being-in-the-World."

What the instructional designer "plans," what the test constructor "measures," what the teacher "teaches" and what the student "learns" are usually entirely different things. The point is that all these participants have different orientations (interpretations and interests) toward the outcomes of the instructional process.

Good teaching is not solely a matter of objective pretesting, setting objectives, presenting information (in some programmed or strategical manner) and post-testing. For an instructional designer or a developer of curriculum materials it is well-nigh impossible to anticipate the exact nature of learning outcomes which ensue from the "give and take" transactional processes. A good social science teacher, for example, does not simply assume that the logical structure of a social science article will automatically result in an equivalent psychological structure in the mind of the student. Instead, it is probably the "natural attitude" of a talented teacher to place himself in the position of the student: through empathic understanding he anticipates what impact a certain article, a thought, a new idea, an item of information in some imaginative form will make on the mind of a student. That is, the teacher makes an attempt to look at things "through the eyes of the learner." And in this manner he "rehearses" the transactional process which is instruction.

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[36] Martin Heidegger, *Being and Time* (London: SCM Press), 1962.

This is not as simple a technique as it may appear on first sight. Because of sociological and psychological reasons learners in school are members of different epistemological communities than their teachers. Maruyama[37] has outlined some of the problems involved in an empathic participating in another's epistemology, a technique he refers to as "transpection."

To be able to exercise the kind of practical control along the lines of the methodology of cybernetic phenomenology, the teacher must acquire certain crucial insights from case studies of typifying[38] examples[39] of instructional phenomena. Cybernetic phenomenology is, therefore, not just a technique for acquiring practical control of instructional situations, but its other main function is to study and analyse aspects of the instructional reality phenomenologically, i.e., with the express purpose of elucidating the essence of instructional phenomena. The assumption is that a phenomenological understanding of instruction will give the teacher a better grasp of things at the concrete or experiential level.

Both behavioral cybernetics and the phenomenological approach can make instruction their field of inquiry. However, the two orientations do have different methodological aims. Behaviorism is a science in the sense that it produces theory which makes possible prediction, explanation and control of instructional facts. Phenomenology, on the other hand, is closer to a philosophical mode of enquiry. Its aim is the clarification and revelation of "essences," that is, of "typical instructional phenomena." Instructional cybernetics stakes off the relevant domain within which the phenomenological method can be fruitfully applied. The two methodologies are mutually exclusive and unbridgeable in the sense that they intend to do different things.

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[37] Magoroh Maruyama and James A. Dator, *ibid.*

[38] Alfred Schuetz, *ibid.*

[39] Jacobus J. Buytendijk called phenomenology the "science of examples."

The suggestion is that cybernetics and phenomenology both have something unique to offer in the way that they may complement one another within the context of an orientation called 'cybernetic phenomenology.' This particular way of studying instruction hopefully will provide the practicing instructor with an instrument for comprehension of essential instructional phenomena and for modest prediction of relevant instructional events. Thus, cybernetic phenomenology combines the theoretical rigor of systems thinking with an increased sensitivity of communication thinking on an interpretative experiential or existential level.

In the study, of which this essay forms the introduction, an attempt is made to describe cybernetic phenomenology as a dual method and to present a convincing argument for the usefulness of such an approach to the study of instruction. Apart from the concerns of ordinary instructional practices, there are typical instructional phenomena which have rarely been under the probing scrutiny of a similar kind of epistemology. Since my first studies at a Pedagogical Academy in the Netherlands I have been particularly impressed by the book *Persoon en Wereld* (Person and World) edited by J. H. van den Berg.[40]

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[40] J. H. van den Berg en J. Linschoten, *Persoon en Wereld* (Utrecht: Erven J. Bijleveld), 1963.

It contains a fascinating collection of phenomenological studies of a wide array of psychological topics. I have always wondered why such an approach has never been attempted in the area of instruction. A large number of very relevant case studies can easily be conceptualized. Certainly, any teacher could benefit from an increased awareness emanating from such studies, and this even more so if he could take an active part in it. In the final part of the dissertation, a case study is attempted, entitled "The Sorcerer's Apprentice." It endeavors to uncover the essential aspects of a specific "typifying" relationship between a teacher and his student. Almost everybody has had at least one such "outstanding" teacher in his or her life. A teacher who somehow managed to convert learning into a 'magical' process, and who left an indelible imprint upon our person. This teacher was not more effective because he used better "teaching methods" or because he was a better instructional programmer; the difference is probably to be sought in the instructional "relation" between himself and his student. A phenomenological analysis may elucidate this relation.

Chapter III

THE SCIENTIFIC APPROACH TO INSTRUCTION

This study departs from the belief that some leading educators in the area of instruction are currently heavily biased toward; namely, that scientific theory construction will create order out of the confusing and conflicting mass of accumulated data and principles of teaching and learning. In an article entitled "Theories of Teaching," N. L. Gage[1] drew attention to the fact that problems of classroom instruction need not only theories of learning but also theories of teaching. He stated that "theories of teaching deal with the ways in which a person influences an organism to learn."[2] According to Gage, theories of teaching are based on a number of paradigms, some of which are derived from theories of learning.

Gage is interested in the "inherent order and lawfulness that can be subjected to theoretical analysis."[3] The "lawful relations" existing between teacher and learner can be illustrated with a conceptualization of the instructional process based on teaching-learning viewed as "cognitive restructuring." The theory founded on this paradigm sees the teacher as manipulating the cognitive field in accordance with "laws of cognition."[4] Learning, then, is to be regarded as the consequence of some causal sequence; the learner, according to Gage, "can no more avoid learning in this instance than he can avoid seeing the phi-phenomenon under proper conditions."[5] By manipulating principles of cognitive structure in the same manner as he would manipulate stimuli, the teacher can "compel"[6] his students to understand, for example, the principles of extrapolation.

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[1] N. L. Gage, "Theories of Teaching," *Theories of Learning and Instruction*, The Sixty-third Yearbook of the National Society for the Study of Education, eds. Earnest Hilgard and Herman Richey (Chicago: The University of Chicago Press), 1964.

[2] *Ibid.*, p. 268.

[3] *Ibid.*, p. 270.

[4] *Ibid.*, p. 278.

Gage further develops his thesis of theories of teaching based on various paradigms in the third chapter of the *Handbook of Research on Teaching*.[7] In it he strongly urges a type of research that is rooted in genuine theory. The framework of theory can serve as a means for doing investigations. And since theory building may also be regarded as the prime end of doing research on teaching, research and theory appear to acquire similar aims: "increasing our power to understand, predict and control events of a certain kind."[8]

The same emphasis on developing scientific theories of teaching and of instruction (i.e., teaching-learning) is to be found in the pamphlet "Criteria for Theories of Instruction"[9] prepared by the ASCD Commission on Instructional Theory. In this influential document the term 'theory' has been redefined for educators to give it the meaning "as it is used in the natural sciences." In doing this the Commission has deliberately and explicitly adopted "the physical science model as their ideal . . . (since) it does indicate a direction toward precision in theorizing about instruction which we believe is required."[10] Furthermore, the Commission is of the opinion that "when persons in education become active in building theories of instruction in the tradition of the natural sciences, the power of the theories that are developed will rapidly surpass the rule-of-thumb approach of the layman or the practitioner."[11]

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[5] *Ibid.*

[6] *Ibid.*

[7] N. L. Gage (ed.). *Handbook of Research on Teaching* (Chicago: Rand McNally and Co.), 1963.

[8] N. L. Gage, "Paradigms for Research on Teaching," *Handbook of Research on Teaching*, ed. N. L. Gage (Chicago: Rand McNally and Co.) 1963, p. 96.

[9] Ira J. Gordon (Chairman and Ed.). *Theories of Instruction* (Association for Supervision and Curriculum Development, NEA), 1968.

The main portion of this pamphlet is devoted to a set of Ten Commandments which were formulated to provide the 'criteria for assessing the formal properties of theories of instruction.' Some of these criteria include the following:

(I) A theory of instruction should include a set of postulates and operational definitions of terms involving these postulates. A corollary of this point is that the theory should include a minimum number of primitives which cannot be defined ("experience," "awareness," "real self," "process").

(III) A theoretical construction must have internal consistency—a logical set of interrelationships.

(IX) An instructional theory must be capable of not only explaining past events but also of predicting future events.

People such as N. L. Gage, Robert M. W. Travers, David G. Ryans, Ronald T. Hyman and E. S. Maccia wrote on the need and nature of instructional theory; Jerome S. Bruner brought some articles together in a book entitled *Toward a Theory of Instruction.*[12] However, as shall be demonstrated later on, Bruner's notion of "theory" differs considerably from the scientific concept. In the article "Towards Taking the Fun Out of Building a Theory of Instruction,"[13] Travers pointed out some serious shortcomings in Bruner's *modus operandi* in the area of theory construction, particularly with reference to Bruner's apparent reluctance to cite evidential sources for his theoretical statements and claims.

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[10] *Ibid.*, p. 4.

[11] *Ibid.*

The emphasis on theory and theory construction can be seen also in the *Second Handbook of Research on Teaching*, edited by Robert Travers. In his preface Travers expressed his concern for the fact that the editorial board had experienced "even greater difficulty in finding significant research to report" than did their predecessors in the 1963 *Handbook*. And in Chapter Four of the introduction, Bloom[14] is quoted as saying that "educational research traditionally has been weak in its theoretical formulation."[15] Building theories of instruction, according to Richard Snow, is "extremely useful, perhaps even indispensable, in pursuing research on teaching.[16]

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[12] J. S. Bruner, *Toward a Theory of Instruction* (New York: W. W. Norton & Co., Inc.), 1966.

[13] Robert M. W. Travers, "Towards Taking the Fun Out of Building a Theory of Instruction," *Contemporary Thought on Teaching*, ed. Ronald T. Hyman (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1971.

[14] Benjamin S. Bloom, "Twenty-five years of educational research," *American Educational Research Journal*, 1966, 3, pp. 211-221.

[15] Richard A. Dershimer and Laurence Iannaccone, "Social and Political Influences on Educational Research," *Second Handbook of Research on Teaching*, ed. Robert M. W. Travers (Chicago: Rand McNally & Co.), 1973, pp. 113-121.

Clearly the recommendation from many leading educators in the field is that research on instruction should be guided by and directed toward theory construction.

The Aim of Instructional Science

What is the aim of instructional science? This question is of interest, because, if it can be answered with some degree of confidence, a criterion which has a dual leverage has been acquired. First, it would be possible to assess the state of the nature of current instructional theory, i.e., its achievements. Secondly, it would provide a view of the scope and limits of scientific inquiry in instructional phenomena.

The attempt to formulate an "undisputed" definition of science is probably a futile effort. The term science appears for prestigious motives in a great variety of contexts—Christian Science, the science of boxing, scientific weight reduction, astrological science—so that such a definition would no doubt suffer from a severe case of comprehensiveness, so inclusive that it becomes meaningless. Therefore, the discussion of the concept "science" here is not to separate the "corn from the chaff," the sciences from the nonsciences, although such a separation may be a useful exercise, but it is to identify a type of approach to acquire a certain kind of knowledge, an epistemic methodology, and to fix a label to it. Only a specific sort of activity in this study is used with the term science.

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[16] Richard E. Snow, "Theory Construction for Research on Teaching," *Second Handbook of Research on Teaching*, ed. Robert M. W. Travers (Chicago: Rand McNally & Co.), 1973, p. 77.

It is a fact that among philosophers of science and scientists of the academic community there exists an adequate consensus about which criteria are to be applied in the scientific investigation of phenomena.[17] The specific epistemic orientation which is characteristic for the methodology of science includes such criteria as objectivity, logical consistency, and testability.[18]

Science, as a practical activity, is normative. It differs from other approaches in the production of knowledge only in what norms are being used. But the norms say as much about the ends as about the means of the activity of science. Science is not simply to be seen as a body of knowledge, but as a purposeful activity. Science is a process concept rather than a product concept. That is to say, science is not primarily to be found on the shelves of a library but rather in the activities of those who practise it.

Thus, science is viewed as a practical activity which people engage in when they set out to describe states of affairs in the world, i.e., the way something 'is.' This activity is pursued systematically, with logical consistency and publicly, i.e., in such a manner that other scientists can corroborate the findings. Although 'science' should not be identified with the chapters in a textbook or with articles in a professional magazine, it should be noted that the aims of science are nevertheless reflected in the statements it produces. Propositions are the essential product of science. Furthermore, the basic postulates underlying the scientific endeavor are not different for the physical and the social sciences. This implies that supernatural explanations of phenomena cannot be accepted; that Nature is assumed to be uniform, regular and orderly, not whimsical; and that individual and social phenomena are assumed to be part of the natural world.[19]

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[17] In an attempt to catch the spirit of this consensus Lastrucci has defined science as an objective, logical and systematic method of analysis of phenomena to permit the accumulation of reliable knowledge. Carlo L. Lastrucci, *The Scientific Approach* (Cambridge, Massachusetts: Schenkman Publishing Co., Inc.), 1963, 1967.

[18] This set of criteria may be viewed as a paradigm of the kind Thomas S. Kuhn has talked about. And there occur shifts of emphasis and structure in the paradigm. What is understood in, for example, the German scientific community as *Wissenschaft* is not quite the same as the notion of science as viewed by North American scientists.

Science is a single methodology in terms of its norms and its purposes. But this does not mean that all scientists make use of the same techniques and instruments. What activities, techniques, and measuring instruments are to be used is largely determined by the nature of the phenomena and the type of problems in which an investigator is interested. What makes a given field of study scientific is not simply its achievements but the kinds of things it attempts to achieve, namely, the discovery and explanation of relations among phenomena.

This dual aim of science is reflected in a distinction which is sometimes made between correlational and theoretic sciences. Pure correlational studies attempt to identify statistically significant relationships between or among observable phenomena. Theory tries to explain these relationships. Ideally, then, correlational and theoretic procedures go hand in hand under the single methodology of science. To say the same thing differently, science is a practical activity aimed at the development of theory.

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[19] See Lastrucci for a systematic discussion on the major postulates of science, pp. 37-47.

This section was introduced with the question, What is the aim of instructional science? That question can now be answered. In its aim instructional science does not differ from any other science. Instructional science has as its objective discovering relations between or among instructional phenomena and producing explanations for instructional phenomena. That is, the objective of instructional science is to produce instructional theory.

The Nature of Instructional Theory

For his scientific discourse a scientist makes use of a language. The words (labels) of the language are termed variables and the statements (sentences) are called propositions. A "meaningful" vocabulary is provided by rendering the variables into concepts. Thus, propositions state relationships among variables and theories state relationships among propositions.

Ideally, a proposition which states some relation on variables can be quantified. That is, a numerical value can be assigned to a scale on which a dependent variable moves while the independent variable is held at some minimum or maximum *extremum*. Sciences which have refined their theories with such a precision are usually referred to as exact sciences. It is easy to see that most of the physical sciences and few or none of the social sciences (including the study of education) belong to the category of the exact sciences.

In general, scientific theory yields the power to predict, explain and control observed phenomena and events. However, as Gage pointed out, "Prediction may rest on mere empirical correlations that do not necessarily make sense. Control can be achieved with techniques that we actually miscomprehend."[20] Much research in the area of education consists of executing correlational studies. The results of these studies may yield valuable data in the form of scientific phenomena. However, *discovering* correlational patterns is not the same as building scientific theory.[21] The patterns of *discovery* referred to by N. R. Hanson are based, not on mere statistically significant relationships, but on relationships characterized by logical necessity. A scientific theory is not just a list of correlational phenomena.[22]

Through hypothesis testing many valuable data have been accumulated about the instructional process. Choosing any number of research or thesis studies from the shelves, one reads findings which support the use of discussion techniques over lecturing in certain specific circumstances, and lecturing over discussions in other situations. Or they show how 'warm,' accepting, verbal teacher behavior tends to elicit student participation in open discussions, or they demonstrate that a poor language environment or a low socio-economic background tends to produce academically inferior students (that is, as measured by achievement tests).[23] It must be clear, however, that the vast majority of these findings were not designed to discover or corroborate instructional laws. They often only state central tendencies. For example, the majority of students (but not all) of low socio-economic background do poorly on scholastic tests, or many (but not all) students or groups of students 'open up' under a 'warm' and informal teaching approach. Thus, hypotheses which have not been rejected do not 'state' general laws. They can at best only corroborate general principles or laws of nature. Only laws, facts of nature, or general principles are characterized by universal quantifiers (as opposed to existential quantifiers) which lend validity to the logical form of a deductive-nomological explanation.[24] A genuine scientific theory cannot do without the logical generality of law-like propositions. The more often a law has been corroborated or confirmed the stronger the theory becomes within which the law is embedded. At the same time it must be remembered that any scientific law has only been granted universal generality with the understanding that it will lose this status if its universality can be demonstrated to be false. For this reason Karl Popper[25] speaks about the essential criterion of falsifiability of the propositions making up a scientific theory. A theory only stands as long as it has not been shown to be false.[26]

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[20] N. L. Gage, *ibid.*, p. 99.

[21] We speak of theory and theoretic explanations, Margenau says, when the contingency of correlation has given way to logical necessity. Henry Margenau, *The Nature of Physical Reality* (New York: McGraw-Hill Book Co., Inc.), 1950, p. 28.

[22] Although Margenau points out that such a view is not infrequently held among statisticians and akin to the position taken by Mach, Mill, Pearson, and exponents of the Vienna Circle.

[23] It would seem, for example, that some socially disadvantaged students learn through the implicit curriculum of the schooling process an aggregate of "facts of life" which their socially more "fortunate" schoolmates will never fully "understand."

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[24] It is precisely because of the difficulty of including a universal quantifier in its premise that bestows a weak status to a functional argument. Compare Carl Hempel, *Aspects of Scientific Explanation* (New York: The Free Press), 1965.

[25] Karl R. Popper, *The Logic of Scientific Discovery* (New York: Basic Books, Inc.), 1961.

[26] Compare also the paradigmatic changes in the thinking of generations and communities of scientists as elaborated by Thomas S. Kuhn, *The Structure of Scientific Revolutions*, Vol. II, No. 2 (Chicago: The University of Chicago Press, Ltd.), 1962, 1970.

A theory may be regarded as a system of discourse. And it is axiomatic for any system that some of its terms are primitive and some of its propositions are postulates and assumptions which cannot be reduced to more basic ones. Moreover, the terms and propositions of a theory almost invariably refer to phenomena that cannot be directly observed. The theoretic propositions must therefore be translated into operational or empirical statements. To this end the presentation of a theory is usually accompanied by an interpretative discourse which relates theoretic propositions to empirical phenomena. Statements linking theoretic terms and constructs to empirical or operational ones have been referred to as "bridge principles" (Hempel, 1966), "correspondence rules" (Margenau, 1950), "epistemic correlations" (Northrop, 1947), theoretic "dictionary" (Norman Campbell, 1957), and as "text" of equations (Bridgman, 1964).

Every theory consists of an object-language and a meta-language. In the case of instructional theory, the object-language refers to actual instructional phenomena about which the meta-language makes certain explanatory statements. (Mathematical theory is somewhat different from most other theories in that the object-language refers to an uninterpreted symbol system.) However, all theory is characterized by this dual set of statements.

The following schema illustrates the various types of propositions that characterize scientific theory.

THEORETIC PROPOSITIONS

OBJECT-LANGUAGE (ordinary language propositions state:)				META-LANGUAGE (theoretic propositions state:)	
actual conditions observed	←	text or bridge principles	→	theoretic conditions	
					explanans
				scientific facts, principles or laws	
observed phenomena to be explained	←	text or bridge principles	→	theoretic events explained or predicted	*explanandum*

In the domain of object-language two kinds of statements are made. These are synthetic statements describing *a)* observed conditions of some situations, and *b)* certain phenomena or events that ask for an explanation. (In the case of mathematical theory the object-language consists of analytic statements describing, for example, some possible mathematical problem [operations]).

It appears from the above schema that in the domain of the meta-language of scientific theory three sorts of propositions are distinguishable: two kinds of abstract statements corresponding to the two types of statements found in the object-language and a third kind of proposition essential to an explanatory system. The latter refers to scientific facts, principles or laws which have been involved in order to provide nomological strength to the theory. On the abstracted level a theory has the form "if p then q". Logical rules of inference and replacement are involved, if possible, to formalize fully the theoretic propositions, i.e., its axioms and theorems.

Thus, theoretic entities such as currents, atoms, electrons and fields cannot be seen. They belong to the realm of meta-language. What can be seen, however, are light bulbs, wires, spools, magnets and diffraction patterns. These observable entities, described by means of object-language, are then related to the more abstract theoretic entities by means of interpretative text which links abstract concepts to more concrete ones and which characteristically lets us 'see,' for example, electric currents by the movement of a needle over a dial of an ammeter or galvanometer. The interpretative text translates object-language into meta-language and vice versa. And in this function if often makes use of the device of metaphor, analogy and model. Thus, electrons are pictured as tiny balls that move through the conductor as water moves through pipes. And principles of 'resistance,' 'voltage,' 'current,' etc., can also be clarified by drawing the analogy with 'water ducts,' 'water level pressure,' and 'water flow.' In scientific theory a meta-language is employed to formulate explanatory statements about phenomena and events which are empirically described in object-language. A meta-language is characterized by abstract constructs, theoretical terms and formal relations. Since a major objective of science is explanation and prediction, science has to make use of meta-language to perform this function.

Hanson has convincingly researched and demonstrated the idea that the conceptualization of explanatory theory requires a search for a pattern or organization (usually expressed with the help of basic principles, natural laws or scientific facts) within which the observed phenomena appear intelligible. This search for a pattern cannot be understood merely in terms of deductive and inductive thought processes.[27] And it is in the absence of an heuristically satisfying explanatory idea that Charles Peirce's notion of "retroduction" has become accepted. He first advanced the concept of "retroduction" or "abduction" as a translation of Aristotle's third type of inference "reduction." Peirce spoke of retroduction, deduction and induction as three irreducible processes in the act of reasoning.[28] Retroductive statements are not inferred deductively as theorems from more general propositions. Nor should retroduction be viewed as an (inductive) generalization from an accumulated list of statistical data. Rather, retroductive inference is the attempt to create a matching proposition for an aggregate of functionally related phenomena.

Retroductive inference is central to the development of scientific theory. It is the intuitive grasping of the essential organization or pattern of phenomena and expressing this pattern in a theoretic proposition. However, retroduction differs from deduction and induction in that it seems more of an heuristic device than a true type of logical inference. Heuristically, scientific theory constitutes a conceptual

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[27] Attempts have been made to conceptualize the discovery of a pattern in the formation of scientific theory as a purely deductive process, by Peter Caws, "The Structure of Scientific Discovery," *Science*, Vol. 166, 12 December, 1969.

[28] Charles Peirce, *Collected Papers*, eds. C. Hartshorne and P. Weiss (Cambridge, Mass.: Harvard University Press), 1931-5.

Gestalt. In Hanson's words,

> A theory is not pieced together from observed phenomena; it is rather what makes it possible to observe phenomena as being of a certain sort, and as related to other phenomena. Theories put phenomena into systems. They are built up "in reverse"—retroductively.[29]

Hanson has given a fascinating account of the lifelong struggle Kepler waged in his retroductive endeavors. In Kepler's case this search for a theoretic pattern was rewarded with the mathematical formulation of the eliptic motions of planets.

Not all retroduction results in mathematically formalized theory. Take the Darwinian theory of evolution, for example. With only a few basic assumptions it attempts to explain the phylogenetic development and diversification of all life forms. Theoretical terms include the concepts of natural selection, adaptation, specialization, speciation and such a notion as "goodness of fit" between the form of the animal or plant species and the environment in which it must live. The meta-language of Darwinian evolutionary theory does not contain mathematizations. More recent contributions of genetics, however, do just that. Mendelian genetics, chemical genetics and population genetics are formalizing (with the help of mathematics) on a meta-language level some of the details of the theory of evolution.[30] The picture now emerges of theoretic propositions situated in a hierarchy of languages.[31]

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[29] Norwood Russell Hanson, *Patterns of Discovery* (Cambridge: The University Press), 1969, p. 90.

[30] Consider, for example, the computations of equilibrium frequencies which apply the Hardy-Weinberg law to changes in gene frequencies.

[31] Bertrand Russell spoke of a "hierarchy of languages" in his introduction to the *Tractacus Logico-Philosophicus*. See Ludwig Wittgenstein, *Tractatus Logico-Philosophicus* (London: Routledge & Kegan Paul), 1961.

And it is of interest that Russell's notion of "hierarchy of languages" has been compared with the "ramified theory of logical types" which divides propositions into a hierarchy of propositions of different orders.[32] Thus, while the more abstract meta-language of theory (see the preceding schema) makes (explanatory) statements about the more concrete object-language, the meta-language is itself object-language for meta-meta-language discourse. In this fashion, the mathematical formulas of the exact sciences constitute the meta-meta-language of the theoretic terms and constructs. And in turn, the mathematic propositions and equations can be made the object of discourse for the algebra of formal proof-theory. "We explain," says Margenau, "by going beyond phenomena."

Scientific theory always operates at some meta-level. Phenomena and events described in the terminology of object-language can only be explained nomothetically, i.e., by engaging a set of second order propositions couched in more abstract theoretic terms. And the latter can sometimes be further formalized in terms of third order propositions, etc.

Lately, the term retroduction has gained in popularity and with some authors[33] it has come to be identified with "model building." It has been argued that all new ideas, including theory, originate in the use of the power of metaphorical thinking.[34] That is, every concept finds its root metaphor in another metaphor. According to this view, scientific theory possesses historicity along isomorphic connections to some other theory, i.e., one theory stands as an isomorph model for the development of another.

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[32] This theory has been devised to deal with the phenomenon of the paradox. A clear example of a semantical paradox is known as the Grelling Paradox. The word "English" means English and has the property to be English; similarly the word "short" means what it is. Words which do *not* display the property contained in their meaning are called heterological. The paradoxical problem now is whether the word "heterological" is heterological. "If it is then it isn't, and if it isn't then it is." This paradox can be prevented, however, by dividing propositions into different orders and permitting reference only to propositions (properties and functions) of some specified order or orders. For a more formal derivation of the Grelling Paradox see Irving M. Copi, *Symbolic Logic* (New York: The MacMillan Co.), 1967, pp. 345-356.

Particularly in the area of curriculum the construction of models is a popular engagement. These models are supposed to describe or prescribe structures or processes. Furthermore, these models assume sometimes baffling representational designs: intricate linear models, triangles, spirals, flow charts and elaborate drawings consisting of a network of arrows connecting rectangular and circular diagrams.[35] It would be a mistake, however, to regard all model building as theory development,[36] even though the word theory keeps cropping up persistently in such contexts.

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[33] See, for example, E. Maccia, *Logic of Education and of Educatology: Dimensions of Philosophy of Education*, Educational Theory Center, Occasional Paper 64-160 (presented to the Philosophy of Education Society, 20th Annual Meeting, March 24, 1964, Chicago, Illinois), and Karl Pribram, "Neurological Notes on Knowing," *The Psychology of Knowing*, eds. Joseph R. Royce and Wm. W. Rozeboom (New York: Gordon and Breach, Science Publishers, Inc.), 1972, pp. 449-465.

[34] Max Black, *Models and Metaphors* (New York: Cornell University Press), 1962.

[35] See for example the numerous curriculum model designs in Edmund C. Short and George D. Marconnit, *Contemporary Thought on Public School Curriculum* (Dubuque, Iowa: Wm. C. Brown Co., Publishers), 1971.

[36] At least not in the way the concept "theory" is understood by the heretofore mentioned prominent scientists and philosophers of science.

At other times models have been used in the sense of exemplars. Bruce Joyce and Marsha Weil[37] have identified four different sources for the construction of models of teaching. These sources are "social interaction," "information processing," "personal sources," and "behavior modification." Graham Nuthall and Ivan Snook[38] have generated three dominant models of teaching which "compete with each other as alternate ways of viewing the practical activity of teaching." These models are "the behavior-control model," "the discovery-learning model," and "the rational model."

The behavior control model represents the attempt to apply modern behavioral psychology to education. This model is telling for the movements of the development of instructional designs, instructional systems and programmed instruction. Under this label Nuthall and Snook classify psychologists and educators such as Skinner, Glaser, Anderson, Stolurow, Taber and Gagné.

The discovery-learning model has been associated with the inductive method (Taba), cognitive processes and related knowledge structures (Bruner), student self-directed learning (Hendrix), and the sudden assimilation of new data into an existent cognitive/conceptual system (Suchman). Discovery of inquiry method is often contrasted with the more traditional expository or deductive approach. A capable contemporary spokesman for the latter school is the cognitive psychologist David Ausubel.

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[37] Bruce Joyce and Marsha Weil, *Models of Teaching* (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1972.

[38] Graham Nuthall and Ivan Snook, "Contemporary Models of Teaching," ed. Robert M. W. Travers, *Second Handbook of Research on Teaching* (Chicago: Rand McNally & Co.), 1973, pp. 47-76.

The rational model is different from the heretofore mentioned examples in the sense that it originates in a philosophical rather than in a psychological perspective. Men such as Peters have pointed out that the essential characteristic of human behavior is that it is goal directed. Human behavior is, therefore, not to be explained by antecedent causes, but rather in terms of intentions, aims, purposes and life plans. Whether a person has been taught rather than conditioned to demonstrate a certain behavior can be examined in terms of the 'reasons for acting' this individual is able to provide. Research related to the rational model is, for example, executed in the area of interaction analysis. Prominent figures are B. O. Smith, Bellack, and Meux.

The preceding argument about theory and theoretic propositions has been presented for the purpose of clarifying the nature of instructional theory. It can be seen now that instructional phenomena and events can be described in terms of an infinite set of statements. This set of statements is the object-language of instructional theory. It describes specific situations, specific people and the specific changes that take place with reference to certain individuals and the manner in which they relate to some relevant instructional environment in certain instructional situations. The object-language describes a complex network of phenomena and events that an instructional theory is asked to explain. However, in order to perform this task, actual situations, conditions and events must be abstracted into a simpler set of theoretical terms and propositions belonging to the more objective framework of the theoretic metalanguage. This is achieved through the mediating role of the interpretative text.

It appears obvious that something is gained and something else is lost in the course of this procedure. What one gains in employing 'instructional theory' is (presumably) the nomothetic power to explain, predict, and control instructional processes. What would be lost is treated systematically in the second part of this study which will be concerned with a critique of the natural science view of instruction.

It has been pointed out that the theoretic propositions of instructional theory have nomothetic properties. They specifically state that some (set of) variable(s) is functionally related to another. That is, if one variable increases or decreases in value another (or a set of other variables) varies with it. The specification of variables and functions constitute the laws or principles of the instructional theory. Although mathematical formalization and quantification of functional relations among variables is apparently difficult to attain in the social sciences, clearly a minimum requirement for instructional theory is that its meta-theoretic propositions specify these relations at least qualitatively.[39] Nagel pointed out that the principle of causality as a maxim expresses

> . . . the general objective of theoretical science to achieve deterministic explanations, in the now familiar sense of "determinism" according to which, given the state of a system for some initial time, the explanatory theory logically establishes a unique state for the system for any other time.[40]

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[39] See also the recommendations made by the ASCD Commission on Instructional Theory, specifically, criteria on page 23. Ira J. Gordon (Chairman and ed.), *Theories of Instruction* (Association for Supervision and Curriculum Development, NEA), 1968.

[40] Ernest Nagel, *The Structure of Science* (New York: Harcourt, Brace & World, Inc.), 1961, p. 323.

It is not sufficient to merely correlate any two or more variables that are found to occur regularly in sequence. When it is said that x causes y, more is implied than a mere regular relationship between the two. In any causal statement the association of x with y has a temporal component, namely, that y follows x. Every nomothetic relation is marked by the causal arrow of time. More complex causal systems, such as that of closed loop causality, can ultimately be reduced to a series of causal events with alternately inverted arrows.

An instructional theory is not worth the name 'theory' if it does not advance basic nomothetic (causal or functional) qualitative relations between the structures of its constitutive subsystems.

Comments on the State of Nature of Instructional Theory

Turning now to existing theories of instruction, a sobering comment must be made first. In an attempt to cope with the enormous problem of developing instructional theory, educators have frequently tried to simplify their task by redefining the meaning of the concept theory.

Educators tend to stipulate their own definition of the concept of theory instead of adopting the rather well established notion of theory as it is used in the natural sciences and as it has been described by such philosophers of science as Henry Margenau (1950), Carlo L. Lastrucci (1967), Carl Hempel (1965, 1966), Karl Popper (1959), Norwood R. Hanson (1958), or Ernest Nagel (1961). The truth is that there has been very little, if any, activity in the area of instruction which has as its immediate aim 'discovery' and 'explanation.' The question is, therefore, whether it is apt to criticize existent instructional theories in the vein of this study.

Jerome Bruner, for example, does not seem to be interested in 'discovery and explanation.' for he calls his theory of instruction "prescriptive."[41] He is concerned with "how what one wishes to teach can best be learned, with improving rather than describing learning."[42]

Bruner's formulation of a "theory of instruction" is ambiguous in the sense that he *seems* to be doing what he purports *not* to be doing: instructional science. Although his theory is more a 'program' of instruction, it seemingly has the structure of scientific theory. Bruner discusses the four major features which assume the character of axioms of the theory. From these axioms then, Bruner derives his "theorems." But all these theoretic propositions are expressed as "should" statements; therefore, the logical relationship among them is rather problematic. Furthermore, Bruner's main propositions regarding structure and the form of knowledge violates an important theoretical imperative: the statement is not capable of refutation. "Any idea or problem or body of knowledge," says Bruner, "can be presented in a form simple enough so that any particular learner can understand it in a recognizable form."[43] The question is, under what conditions can the statement be demonstrated to be false empirically? Moreover, Bruner's axioms and theorems are concerned with "optimum conditions" of the instructional situation. Hence, it appears that Bruner reverses the process of theorizing. Travers pointed out that "optimum conditions of various kinds derive from theories but are not the essence of scientific theories."[44] In a way Bruner draws his conclusions before (or without) first establishing the argument. The state of nature of a theory can be assessed by examining its main propositions. Bruner's instructional theory has four, and these are related to

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[41] J. S. Bruner, *ibid.*

[42] *Ibid.*, p. 40.

[43] J. S. Bruner, *The Process of Education* (New York: Random House), 1960.

(1) the most effective experiences for implanting a predisposition toward learning;

(2) the optimal structure of knowledge to be learned;

(3) the optimal sequence of presentation of materials, and

(4) the most effective form and pacing of rewards and punishments.

Although the four propositions do not have the structure of a theoretic explanation, the first and fourth propositions seem to acquire nomothetic overtones. The first statement refers to some internal motivational or readiness principle and the fourth appeals to behavioristic motivational factors of reinforcement theory. Only the latter one could be reformulated into an "if p, then q" format. Behavioral control is achieved by strengthening the probability of an operant response through the manipulation of positive or negative reinforcers. Thus, the only lawfulness underlying Bruner's theory is of a Skinnerian nature. The second and third propositions are vague. They seem to be begging the question concerning the nature of the optimal structure and sequence of knowledge: it is that kind of knowledge that can be learned best, which is in fact what one would like to know.

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[44] Robert M. W. Travers, "Towards Taking the Fun out of Building a Theory of Instruction," *Contemporary Thought on Teaching*, ed. Ronald T. Hyman (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1971, pp. 110-122.

Bruner is very eclectic and comprehensive in the interpretative text[45] of his theory. In one way or another he refers to practically all known principles of personality and learning of behaviorist and cognitive orientations. The result is that the theoretic "theorems" about which he speaks completely lack logical structure, in the sense that they do not follow deductively from more basic propositions.

A very different theory of instruction has been advanced by Elizabeth Steiner Maccia. According to Maccia, prescriptive theories are philosophic. Instead, she presents a "scientific theory of instruction." That is, she is interested in explaining "how the (instructional) phenomena we are dealing with are related."[46] The central thesis of Maccia's scientific theory states that "instruction is teaching-learning viewed as influence toward rule governed behavior." The remainder of her presentation should be looked at as interpretative text. In it she further clarifies the meanings of some selected terms.

However, the central proposition of Maccia's theory does not reveal any nomothetic relationship. The theory is incapable of scientific explanation. It cannot be converted into the format "if p then q." Instead, Maccia's proposition has the character of a multiple definition. She defines "instruction" as "teaching-learning" and then she defines "teaching-learning" as a special kind of "influence" (namely, influence toward rule-governed behavior). That is to say, Maccia's theory does not contain any law-like propositions and, therefore, should not be called a "theory" at all. In her interpretative text Maccia further clarifies by means of arrow diagrams what kinds of "influence relations" are possible among a number of individuals. But the relations are not formalized into functional propositions. Maccia's theory does not permit statements which say that, if p increases or decreases, then q functionally varies with it. Furthermore, the empirical referents of the concept influence are not sufficiently indicated. Sometimes the term 'influence' seems to stand for 'authority.' This happens when she explicates that "legitimate influence is based upon position, while expert influence is based upon idealized role." At other times Maccia talks about "the content and motivational bases of influence." The point is, that this kind of interpretative discourse is still at the meta-language level of theory. The theory fails to give empirical significance to theoretic terms such as 'content,' 'motivation' and 'influence.' To say it differently, the theoretic terms of the meta-language are not operationalized in the object-language.

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[45] J. S. Bruner, *Toward a Theory of Instruction* (New York: W. W. Norton & Co. Inc.), 1966, pp. 42-72.

[46] Elizabeth Steiner Maccia, "Instructor as Influence Toward Rule-Governed Behavior," *Theories of Instruction*, eds. James B. Macdonald and Robert R. Leeper (Washington, D.C.: Association for Supervision and Curriculum Development), 1965, pp. 88-99.

This is true, it appears, for many concepts and propositions associated with instruction or teaching-learning processes. There are a great many distinct concepts of teaching. To mention a few: teaching as "arranging conditions which facilitate learning" (Maria Montessori, R. M. Gagné), teaching as "language gaming" (Arno A. Bellack), teaching as "problem solving" (N. A. Fattu), teaching as "information processing" (David G. Ryans), teaching as "information transmission" (Robert M. W. Travers), teaching as "initiation" (R. S. Peters), teaching as "a relation" (K. B. Henderson), teaching as a "system of action" (B. O. Smith), teaching as "maieutics" (Socrates, Plato), teaching as "communication" (J. F. Herbart), teaching as "guidance to self-discovery" (Carl R. Rogers), teaching as "molding" (B. F. Skinner), teaching as "mutual inquiry" (W. H. Kilpatrick), teaching as "behavior modification" (L. J. Cronbach, M. D. Merrill, B. F. Skinner). Furthermore, theoretic explanations are not achieved by simply substituting a term such as 'teaching' with another concept. 'Explanation by concept' is not the same as 'scientific explanation.' Similarly, concepts such as 'implicit or explicit curriculum,' 'taxonomic objectives,' 'teacher behavior,' 'student involvement,' 'team teaching,' 'small and large group instruction,' 'gaming,' 'role playing,' 'lecturing,' 'inductive teaching,' 'expository methods,' 'student relevance' do not possess explanatory relevance. Concepts of this kind do not appear in propositions to refer to general instructional laws, principles or facts. Other propositions containing concepts such as 'creative teaching,' 'humane as opposed to inhumane curricula,' and 'the real self' exceedingly lack criteria of empirical testability.

Thus, in examining instructional propositions two kinds of questions may be asked: 1) Is this proposition part of a theoretic explanatory argument? and 2) Can this proposition be operationalized onto the level of object-language? If both questions can be answered in the affirmative it means that we have encountered a real theoretic proposition. The foregoing questions correspond to Hempel's two basic requirements for scientific explanations, the requirement of "explanatory relevance" and the requirement of "testability."

Much so-called instructional "theorizing" is a free form of "ideation,"[47] i.e., conceptualizing ideas on a level of meta-language without securing an adequate empirical import for the ideational terminology and/or without rigorously shrouding the ideational set of statements in relationships of logical necessity.

Comments on the Scope of Instructional Theory

In common sense reasoning nomothetic connections often are implied but seldom made explicit.

Hempel spoke of "elliptical explanations" to refer to such incomplete explanatory arguments. Deductive-nomological explanations are stated in elliptical form, according to Hempel, when "they omit mention of certain assumptions that are presupposed by the explanation but are simply taken for granted in the given context."[48] Within the context of the present argument it makes more sense to regard an elliptical explanation as a theoretic explanation that has only been expressed in the object-language of the theory within which the phenomena described can be explained. Consider, for example, the statement: "The bottles of pop have broken because they were left in the freezing temperature." This explanation does not make explicit reference to a law but indirectly it assumes one; namely, that water expands when it changes into ice. To be sure, more propositions would have to be added to convert the above proposition into a deductive-nomological explanation. Conditions must be further described in terms of specifications concerning temperature, condition and composite materials of the bottles, and additional laws must be adduced which pertain to pressure, stress and molecular cohesiveness of the chemical compound H_2O.

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[47] Alfred Schuetz used this term to refer to all abstracted idea-forming characteristic of the natural or physical sciences.

[48] Carl G. Hempel, *Philosophy of Natural Science* (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1966, p. 52. A complete deductive nomological explanation takes the form $C_1, C_2, C_3 \ldots C_n$ and $L_1, L_2, L_3 \ldots L_n$ therefore $E_1, E_2, E_3 \ldots E_n$.

An elliptical explanation fails to make use of theoretic terms belonging to the domain of meta-language of the theory. Every theoretic explanation has to proceed via the meta-level of theory. An elliptical explanation is therefore merely a shortcut which may, however, hide the ignorance of those who do not know the entire proper route.

In the area of instructional processes one often meets explanations, seemingly elliptical, for which there are no complete theoretic accounts. These are especially of concern if they attempt to lend further credence to their status by appealing to pseudo-scientific laws and by making use of specialized ideational terminology.

Thus, one hears that teacher X has been so successful "because" she used the multi-media approach in teaching these concepts; or that the students really understood the lesson "because" the teacher "had gone over it three times;" or that the students did not gain much from the lesson "because" there was too much "teacher talk;" or that those students achieved the higher taxonomic objectives "because" they were capable of divergent thinking.

Clearly, the limits and scope of instructional theory appear to lie in the availability of real theoretic propositions, with the help of which explanatory and predictive statements can be made concerning instructional phenomena. In a lucidly written little book on the nature of social science, George C. Homans[49] has argued that many if not most phenomena of sociology, anthropology and even history can be explained through a process of reduction to very basic principles or laws of psychology. A similar argument probably can be developed for instructional science. Upon looking a bit closer at the many different conceptions of teaching and related concepts of the instructional process it becomes evident that, although the various definitional propositions of instruction do not explicitly mention any instructional laws, some very general law-like propositions are at least tacitly presupposed. A clue to such a general law is provided by the observation that underlying virtually every "methods" concept of instruction one can think of is the idea of "information processing." E.g., the maieutic concept of teaching employs discussion and question-answer techniques, while the expository method is exemplified by lecturing, demonstration, telling, showing. These, and also many of the more general concepts of instruction that have been cited on the preceding pages have in common, that, whatever kind of learning formation takes place, this formative dimension of instructional genetics is inseparably connected with the process of information genetics. This fact, it appears, is most basic to all instruction: there is a lawful relationship between "formation" and "information." The nature of the formative process of the psychology of an individual is invariably and functionally related to the informative aspects of his instructional environment.[50] Concisely stated:

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[49] George C. Homans, *The Nature of Social Science* (New York: Harcourt, Brace & World, Inc.), 1967.

[50] Similarly, biochemical processes are a function of the communication of energy— in the form of food, air, sunlight—of a person's environment.

man is being "formed" by being "informed." An immediate logical derivative of this proposition is, that no information that comes to him leaves man completely unaffected. This basic instructional fact—however vague and seemingly trivial—expresses a real theoretic proposition which can, at least in principle, be tested.

Scientific methodology adopts a mode of observation which looks at instruction as an objective reality wherein teaching and learning are processes which can ultimately be defined in terms of variables, systems and systems behavior. The language of instruction commonly reflects an ontology within which the behavior of the teacher is causally or functionally linked to the behavior of the learner. A fundamental assumption underlying a scientific view of instruction is that instructional outcomes are the result of a series of causal (or functional or deterministic) sequences. The practical activities of an instructional designer are seen as "causing a learner to learn something specifiable." Insofar as this assumption is hardly ever made explicit, the various models of instruction are not sufficiently understood.

We see a teacher enter a classroom and we observe him 'draw' the attention of the students to some item of communication. His words and gestures have 'attracted' the eyes and attention of the learners and have 'caused' them to open their books and 'turn' to a certain page. Next, the teacher writes something on the blackboard. He draws diagrams, lines and arrows and again it appears as if his hand with the chalk is 'pulling' the eyes of the students across the board to focus on various places where the chalk leaves traces on the blackboard. This kind of relation between teacher and learner may be called 'functional.' The teacher induces a certain 'state' in the learner whereby a specific kind of teacher behavior calls forth specific learner responses. The models that most clearly reflect the scientific attitude are those of behavior modification, instructional systems development, and instructional programming. Outcomes of the instructional process are treated as the products of some kind of manufacturing process and these products are evaluated as behavioral measurements in terms of scaled (ideally) performance criteria. The point could be made that every scientific view of instruction is ultimately reducible to a systems model. In the following chapter such a systems model will be elaborated.

Chapter IV

A COMMUNICATION VIEW OF INSTRUCTION

The analogy between communication theory and instructional theory seems intuitively quite acceptable. In essence, it views problems of instruction (teaching and learning) as problems of generating, communicating and processing information.

In scientific theory models may serve a variety of functions. One of these functions is the use of theory as an heuristic device for the development of a different theory which is isomorphic to the first. To suggest that a communication system is isomorphic to an instructional system is to assume that human teaching and learning systems operate under constraints that are sufficiently similar to communication systems. Whether this assumption is correct and useful can be determined only by empirically assessing the theory of instruction that is built on this basic premise. Of course, there are some obvious differences between mechanical and live communication systems. A computer may be switched on and off. And it is up to the programmer which information he wants to 'feed in' and what sort of operations he may ask the computer to perform. Human learners on the other hand, cannot help but be 'plugged into life.' Says D. O. Hebb,

> . . . any organized process in the brain is a motivated process, inevitably, inescapably; the human brain is built to be active, and as long as it is supplied with adequate nutrition it will continue to be active. Brain activity is what determines behavior, and so the only behavioral problem becomes that of accounting for inactivity.[1]

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[1] D. O. Hebb, "Drives and The CNS," *Brain and Behavior*, 4 Vols., *Adaptation*, Vol. 4, ed. K. H. Pribram (Middlesex, England: Penguin Books Ltd.), 1969, p. 177.

Unless in a state of sleep or habituation (and probably even then) human beings are continuously processing information provided by the fact of environmental variety. Communication is an active (or transactive) process. As long as the organism is alive it cannot help but be actively tuned into its environment. To communicate means to do something to the environment, to gather the information a particular environment may yield. The simple fact of 'perceiving' is an instance of such transactive communicative behavior. The question is, therefore, not so much 'whether' a student will learn but rather 'what' he will learn, in what manner and at what rate. Teaching is the means through which an educator may attempt to exert control on the kinds of information and the kinds of operations with which a learner will be engaged. In these pages the term 'instruction' refers only to those teaching and learning acts that can be described as elements of a controlled instructional system, and when reference is made to the term 'teaching' in these pages, only the instructional interpretation of the term is intended.

The Instructional System

The instructional system is a communication system in two senses:

(1) There is communication between the entire system and its environment. The system acquires information from the outside world and it is the educator's task to understand how the information can be made to enter it from the world. In this context it is useful to consider, for example, Mauritz Johnson's conception of the output of the curriculum development system as the input of the instructional system.

(2) There is communication within the system. The various parts (also systems) must communicate with each other using certain techniques of encoding and decoding information and some mechanism of feedback and control. This study will deal only with the latter distinction.

Turning to the teaching-learning system, instruction may be defined as a system in which the selective storing, organizing and mapping of information by one subsystem (i.e., the learning system) is facilitated (controlled) by another subsystem (the teaching system). The dividing line between the learning and teaching systems is partly conceptual. It can be drawn at various places depending on what variables are included or excluded. Even certain parts of the cortically recorded information (memories) may be treated as (internal) environment for the learning system. The role of communication in the teaching-learning system is to make the properties of the learning system alter in such a way that its behavior will be different presumably to provide for a more satisfactory (in terms of knowledge, skills and values) "orientation,"[2] toward the everchanging contingencies of new life experiences. Communication (of energy or information) may be said to exist between A and B if there is a relation between the behaviors at A and B. This relation may be causal-mechanical as between the connected parts of a steam engine, or the relation may be functional as between the (materially) unconnected parts of a social group. Thus, A and B do not have to be connected functionally.

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[2] The concept "orientation" is a thematic concern of cybernetic phenomenology, and is examined more closely as such in later chapters of this study.

Information may be conceived as something we need when we face a choice.[3] The term 'information' does not directly refer to knowledge or skills but rather to a 'reduction of entropy or uncertainty' in the organism. That is, any time a person is confronted with the necessity of making a choice uncertainty arises, information is needed, and thinking occurs. Pribram[4] actually proposed that active uncertainty may be defined as thought.

In general, the 'display' of the instructional system consists of information selectively coded according to some general and special criteria. Coding often simply means communicating to a person in the appropriate language. Some of the general criteria are derived from knowledge of the nature of the information (i.e., the systems of knowledge) itself. Other general criteria are derived from such theories as motivation, learning, and communication. Special criteria for organizing the display are a result of the knowledge of the motivational 'state' of the learner and his conditional readiness for selectively 'transacting' with the display in order to map certain aspects of the external variety into his structure. The problem, of course, is that the learning system is extremely complicated. Attitudes, activities and motives of the learner have to be studied within a systems approach as well as his cognitive styles, his sentiments, his value systems and so on.[5]

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[3] George A. Miller, *Language and Communication* (New York: McGraw-Hill Book Co., Inc.), 1963, p. 100.

[4] Karl H. Pribram, "Neurological Notes on the Art of Educating," *Theories of Learning and Instruction*, ed. Ernest R. Hilgard, The Sixty-third Yearbook of the National Society for the Study of Education (Chicago, Illinois: The University of Chicago Press), 1964, pp. 78-109.

The teaching system is always selectively constructing displays, devising communication networks (instructional media and techniques) and generally building ecological arrangements in which the teaching-learning process can function most effectively and efficiently.

The concepts and conceptual configurations making up a learner's cognitive/affective structure provide him with 'a set of rules' to generate meaningful information out of a display of potentially meaningful signs. In the act of learning through information processing learners 'map' into themselves through the process of symbolic mediation some of the environmental variety 'displayed.' Variety of constraints in the learning system consist of postulated cognitive and affective configurations which correspond to certain conditional probabilities of behaving. Variety in the teaching system (as 'perceived' by the learner) is selectively mapped or coded into the display with which the learner is invited to transact. So the (transactional) learning process consists of performing selective operations (manipulations) upon the display (the coded information) which provides information. In the ideal instructional process, acts of manipulation and information (teaching) are (numerically equal to or) directly related to the increase of knowledge (in the learner). In most cases, however, this maximum efficiency of procedure is not reached. The occurrences of superfluous, redundant and irrelevant information are some measures of the inefficiency of the teaching process. Part of the information sent may be superfluous. That is, the receiving system is not 'equipped' or 'ready' to operate on it. This happens when a teacher 'teaches over the heads' of his students. In cognitive terms, the new concepts contained in the display do not 'fit' into the learner's existent cognitive structure. The learner does not know how to 'interpret' the new information with the concepts he does hold. For example, when a layman is invited to look into a microscope, he may see only 'meaningless' patterns consisting of lines, colors, and textures. Another part of the information transmitted may be redundant by supplying information which is already known. The non-redundant part in its turn, consists of a relevant (teacher relevancy) and an irrelevant part. The irrelevant information increases the learner's knowledge but it is not relevant with respect to the formulated instructional objective. The relevant information does contribute towards an increase of knowledge within the context of the instructional objectives. Another kind of relevance (learner relevancy) has to do with the conditional state of readiness of the learning system. An important consideration for the teacher is that the input-output ratio at any particular time is related to (or dependent on) the particular state of the learning system at that time. To say it differently, a 'meaningful' concept (which is a cognitive problem) is not necessarily a 'relevant' concept for a student. And it is generally assumed that to perform cognitively the learner has to be motivated affectively.

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[5] Gordon W. Allport, "The Open System in Personality Theory," *Modern Systems Research for the Behavioral Scientist*, ed. Walter Buckley (Chicago: Aldine Publishers, Co.), 1968, p. 347.

The Meaning of Symbols

Concepts are cognitive variables (units of meaning) that mediate between stimuli and behavior: Kaplan[6] calls concepts "rules for acting." The 'meaning' of an item of information (display) is not something situated in the signs carrying the information but rather a relationship between the teaching or learning system and the display. In Buckley's[7] words, "Meaning is generated during the total transaction" of the system with the display and "meaning ceases to exist when the transaction is terminated." George Herbert Mead[8] points out that in symbolic communication, a person tends to respond to the meanings evoked by his own symbolizing behavior. This reflexiveness of symbolically mediated behavior is essentially a feedback control system that accounts for what we call 'self-consciousness.' Thus, the symbol can mediate by acting both as an evoked meaning and as an activator for further transactive behavior. In this way the individual is capable of becoming a self-regulating, self-controlling organism that is engaged in instructed learning and self-instructed learning. His ensemble of symbols represents mappings of possible or potential meaningful and behavioral relations with his environment. That is, the individual's actual structure of meanings represents the nature and scope of his effective environment.

Certainty and Uncertainty

Uncertainty is directly related to the amount of novelty or information some environmental display exhibits to a learner. If everything about the display is information or novel then there is total uncertainty which amounts to randomness. No learning system can learn from a display which—relative to the learner, of course—contains nothing that is familiar. The content of a teaching display that contains only information appears totally unstructured and disorganized; no meaningful elements can be discerned. If, on the other hand, some display item exhibits nothing new to a learner in terms of elements and structure, then there is total certainty. In this case the content of the display is said to contain redundant information; that is, it carries no information for a learner. And no learning system can learn from a display that contains no information.

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[6] Abraham Kaplan, *The Conduct of Inquiry* (San Francisco, Cal.: Chandler Publishing Co.), 1964.

[7] Walter Buckley, *Sociology and Modern Systems Theory* (Englewood Cliffs, N.J.: Prentice-Hall Inc.), 1967.

[8] George Herbert Mead, *On Social Psychology* (Chicago: The University of Chicago Press), 1934, 1969.

Pribram has pointed out that not all information that reaches us via the sensory organs leads to learning. Some information is so novel (such as difficult mathematical formulas for a layman) that this information is inhibited from entering the processing stage. Novel information that possesses no familiarity of context does not bring a learner into a state of active uncertainty or readiness. It appears, therefore, that a good teaching display contains sufficient redundant information that a learning context is provided. That is to say, the learner can match at least part of the display with the existent knowledge (also information) he has about the matter. At the same time, however, the display must contain novel information which results in 'mismatches' with the learner's cognitive structures and thus motivates (induces) a readiness to learn. This readiness, which has also been expressed in terms of cognitive dissonance (Festinger), imbalance

(Heider), and incongruencies (Rokeach) is here defined as a state of uncertainty leading to further information processing to reduce this uncertainty. Furthermore, uncertainty can be translated into common psychological concepts with import of ordinary language meanings. Terms such as 'surprise,' 'doubt,' 'perplexity,' 'bafflement,' and 'contradiction' have been discussed[9] within a context related to the notion of uncertainty.

Novelty and Redundancy

It appears then, that novel information must be presented in the context of redundant information.

> In general, we do not like to be told either what we already know or what we are unlikely ever to know well or to good effect. We do not read books if we are already thoroughly familiar with the material or if it is so completely unfamiliar that it is likely to remain so. We read books which help us say things we are on the verge of saying anyway but cannot quite say without help.[10]

For a learning system to process information most effectively the amount of redundancy and novelty must be carefully proportioned. One measure of efficiency for processing receiver information is expressed in terms of 'channel capacity' of the learning system. The question is whether this proportioning of content and context should be done "for the learner" as in programmed instruction, or if it should be done to a certain degree "by the learner" himself. The general idea is that an excess of novelty in a teaching display is inefficient because the learner can only process a limited amount of information within a certain period of time. Similarly, a lack of novelty is ineffective since it leads to boredom. In Pribram's words:

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[9] D. E. Berlyne, *Conflict, Arousal, and Curiosity* (New York: McGraw-Hill Book Co., Inc.), 1960.

[10] B. F. Skinner, *Beyond Freedom and Dignity* (New York: Random House), 1972, p. 8.

> Habituation reflects redundancy; novelty indicates information and uncertainty. The expectancy-novelty process may thus be conceptualized as a mapping of intensity into a spatial neural dimension, an Image out of which interest is engendered.[11]

The central nervous system is designed to cope with environments that produce a certain rate of influx stimulation and information. It will not perform in an environment that is either deprived or overloaded (producing stress).

Homeostatic Systems

On the basis of recent neuro-physiological evidence Pribram has likened the information processing learning system to the homeostat which is conceived essentially as a self-regulating system acting on a set bias (such as a certain temperature).

> . . . the reinforcing event acts on a neural mechanism preset by the drive stimulus . . . the drive structure is conceived to preset the organism—to provide the context within which the reinforcing events are to operate. Drive, structured as a biased homeostat, thus serves in turn as the bias or setting for the consequences of behavior.[12]

Homeostasis, a term proposed by Canon, is the general property in terms of which systems engage in regulative behavior, to keep constant or maintain internal norms. The homeostat is a system which adapts by ultrastability if it is coupled to an environmental system which induces into the homeostat an unstable state. The homeostat, in a sense, does nothing more than run to a state of equilibrium.

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[11] K. H. Pribram, "The New Neurology and the Biology of Emotion: A Structural Approach," *Brain and Behaviour*, 4 Vols., *Adaptation*, Vol. 4, ed. K. H. Pribram (Harmondsworth, Middlesex, England: Penguin Books Ltd.), 1969, p. 452.

[12] K. H. Pribram, "Reinforcement Revisited: A Structural View," *ibid.*, p. 314.

> Any subsystem that stays constant is, by definition, at a state of equilibrium. If the subsystem's surrounding conditions (parameters) are constant, the subsystem evidently has a state of equilibrium in the corresponding field; if it stays constant while its parameters are changing, then that state is evidently one of equilibrium in all the fields occurring. Thus constancy in a subsystem's state implies that the state is one of equilibrium; and constancy in the presence of small impulsive disturbances implies stabilities.[13]

More complicated homeostatic systems do not react simply to a set bias but they are also capable of setting new biases themselves. This is the principle of ultrastability. A homeostat is an ultrastable system which can control the very input to which it is sensitive. Ross Ashby has shown that any system made of parts that obey the natural laws of cause and effect must use the method of ultrastability which he defines as follows:

> Two systems of continuous variables (that we called "environment" and "reacting part") interact, so that a primary feedback (through complex sensory and motor channels) exists between them. Another feedback, working intermittently and at much slower order of speed, goes from the environment to certain continuous variables which in their turn affect some step-mechanisms, the effect being that the step-mechanisms change value when and only when these variables pass outside given limits. The step-mechanisms affect the reacting part; by acting as parameters to it they determine how it shall react to the environment.[14]

It is suggested here, therefore, that the entire instructional teaching-learning system may be conceived of as operating on the homeostatic principle of setting and resetting (cognitive) biases by means of a generating, organizing and restructuring of information. The process of self-regulation may occur in the relation between teacher and learner or in the relation between the individual learner and his relevant environment. In the latter case, the instructional situation is conceptualized in terms of an 'autonomous' learner 'controlled' by the contingencies of his environment.

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[13] W. Ross Ashby, *Design for a Brain* (London: Chapman & Hall, Ltd.), 1960.

[14] *Ibid.*, p. 98.

Content-Context Reversal

Pribram's principle of "content-context" or "knowledge-value reversal" becomes a further useful distinction in the instructional process.

> Organisms do not respond to *any* occurrences that happen simultaneously, contiguously. Their behavior is guided by *stimuli*, including those consequent to behavior. And stimuli are context-determined events, "sampled" on the basis of a central process (a neural "set") determined by *prior* experience and by other central events. An organism's behavior is thus context determined, and is, as well, context determining: response produced events, the outcomes of behavior, consequences, are more than likely (i.e., have a high probability to partially match a central process and thus act as stimuli—behavior thus becomes its own guide.[15]

The terms 'context' and 'content' have already appeared in these pages with reference to redundant and nonredundant information. It was pointed out that motivation can only be achieved by presenting novel information in the context of a certain amount of redundancy. Information is redundant when it has already established patterns of expectancy in the learner. Arousal takes place as soon as this pattern of expectancy is broken as a result of exposure to conflicting or novel information. The point is, that during the information processing stage, content has been converted into context. The content of the novel information, which gave rise to cognitive uncertainty, has become itself redundant information. The individual has learned and has acquired a basis (more context) for further learning. Thus, effecting orientating or motivating behavior in the learner is setting a bias, as in a homeostat. Most aptly it amounts to 'turning on' the learner. Conversely, effecting an habituating or bored state of behavior is 'turning off' the homeostat. In the instructional process the nature of the bias is determined by the meaning of the symbolically mediated information.

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[15] K. H. Pribram, *ibid.*, p. 311.

So it may be postulated that learning occurs as a motivational response to a state of uncertainty. Motivation is a behavioral term. That is, a motivational state is effected by a problem solving situation in which the problem is constructed on basis of a minimal level of redundancy (the learning context) and a maximum level of information or uncertainty (the learning content). Since all human beings are conceived as natural information processing organisms, all the teacher has to do is to select and construct such a display that induces into the learner an active state of uncertainty. And according to the equilibration theory of motivation (which defines the learner as an ultra-stable or self-regulatory cognitive system) uncertainty will be reduced by teaching and processing the necessary information for which the learner adopts or sets a goal and chooses a taskplan towards that goal.

A quantitative model of the teaching-learning process is possible if there is a way of assigning values to the parameters involved. A theory of instruction can only be aiming at explanatory and predictive significance if its area of application has been specified, that is, if the theoretical terms have been given adequate empirical interpretation which links them to observable phenomena.[16] The area of the theory of instruction may be indicated by operationally defining the variable values of the parameters such as 'intended learning outcomes or objectives' in terms of 'instructional taskplans,' 'motivation' in terms of 'behavioral learning tasks,' 'display' in terms of 'logical structures,' 'knowledge' in terms of 'conceptual structures,' and 'taskplans' in terms of 'behavioral structures.'

Transactional Adaptation

Cybernetics, originally denoting "steermanship" or "the science of control" (Norbert Wiener), may be defined to refer to the study of processes interrelating systems with inputs and outputs, and their structural-dynamic structure.[17] Founded on the concepts of information, feedback and self-regulation, cybernetics identifies and analyzes control mechanisms or constraints in technology and nature.[18]

The instructional system can be conceptualized as a cybernetic system in which learning changes are viewed as adaptive responses to the challenges of the teaching environment. The teaching function is comparable to a regulatory mechanism in a cybernetic system. Learning changes are measured in terms of negentropic increases. All varieties of learning from simple 'habituation' to 'insight' as outlined by men such as Thorpe and Gagné may be viewed as having evolved as forms of the progressive adaptation of the organism to its environment. The principle of self-organization has been stated in the following formula: external forcings → internal constraints = adaptive self-organization. Laszlo distinguishes three types of adaptation that occur in the interactive process of certain natural systems and their environments.

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[16] Carl G. Hempel, *Aspects of Scientific Explanation* (New York: The Free Press), 1965, p. 170.

[17] Ervin Laszlo, *Introduction to Systems Philosophy (Towards a New Paradigm of Contemporary Thought* (New York: Gordon & Breach, Science Publishers, Inc.), 1972, p. 38.

[18] Ludwig von Bertalanffy, *General Systems Theory* (New York: George Braziller), 1968, p. 17.

(1) First, there is the "function of adaptation to environmental disturbances resulting in the *re-establishment* of a previous steady state in the system."[19] In a given environment the system will stabilize itself adaptively around a certain norm; Ashby talks about an "equilibrium state."[20] For example, self-seeking missiles, industrial control circuits, and complex central heating systems are all instances of systems operating on the principle of deviation reducing negative feedback, maintaining a program under varying conditions. In Ashby's *Design for a Brain* a system coupled to an environmental system engages in adaptive behavior when an essential parameter of the system is brought outside its critical value. The adaptive behavior may be seen as exploratory behavior. Part of the output information is fed back as input and through a process of match-mismatch information processing, the homeostat actively seeks a new state of equilibrium. Organic

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[19] Ervin Laszlo, *ibid.*, p. 36.

[20] W. Ross Ashby, *ibid.*

self-regulation is viewed also as an instance of adaptation to the environment through the maintenance of the steady states of the organism. Endogenetic processes are of this type. For example, DNA (deoxyribonucleic acid) is now accepted as the primary chromosomal constituent that instructs the cells of the organism in the program of its gene activity. Through genetic instruction genes control the differentiation of structure which occurs in multicellular organisms.

The ethologist Tinbergen[21] introduced the term *Sollwert* (literally, "should-value") for something that may be regarded as a mixed endo/exogenetic process—an internal teaching mechanism. Exploratory behavior is adapted to storing or acquiring as much information about an object or situation as the subject can get. (This exploration is subjectively experienced as curiosity.) In this exploratory behavior, *Sollwerte* or "templates" of expected (hoped-for) feedbacks play their role. For example, when birds start to sing they do three things: 1) they listen to what they produce; 2) they notice the difference between this feedback and the ideal song as they heard it from adult birds; and 3) they correct their next performance.[22] This pattern corresponds closely to the TOTE mechanism as conceptualized by Miller, Galanter and Pribram.[23]

A related type of learning has been discussed by Bruner and Postman, who hold that all cognitive learning requires the setting up of "hypotheses" or "expectancies" which are being confirmed or disconfirmed in the organism's exploratory activities. Thus, input information is matched against these hypotheses either consciously or unconsciously as in lower animals. Thus, the development of behavior is viewed as an exceedingly complex network of events. It starts with innate programming instructions contained in the zygote, which interacts directly with the environment. During 'sensitive periods' this interaction is enhanced by active exploration and this transactive exploratory activity is selectively steered by *Sollwerte* of great variety. Stage by stage this process ramifies and level upon level of ever-increasing complexity is being incorporated into the programming.[24]

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[21] N. Tinbergen, "On War and Peace in Animals and Man," *The Ecology of Man: An Ecosystem Approach*, ed. Robert Leo Smith (New York: Harper & Row, Publishers), 1972, pp. 230-242.

[22] *Ibid.*

[23] George A. Miller, Eugene Galanter, and Karl H. Pribram, *Plans and the Structure of Behavior* (New York: Henry Holt and Co.), 1960.

(2) The second form of adaptation illustrated by the epigenetic process is a

> . . . function of adaptation to environmental disturbances resulting in the reorganization of the system's state, involving, with a high degree of probability, an overall gain in the system's negentropy and information content.[25]

This second category of adaptation Laszlo modelled on Maruyama's notion of "second cybernetics" or "deviation-amplifying mutual causal processes."[26] Phylogenetic (or biogenetic) processes and ontogenetic (or epigenetic) development are analogous in the sense that both describe adaptive processes. That is, adaptive changes in the system come about as a result of environmental pressures. In the former case, one speaks of 'evolutionary pressures'; in the latter instance, the term 'learning pressures' could be applied. Both types are positive feedback deviation-amplification processes activated in response to a need for adaptation under 'evolutionary pressures' and 'learning pressures' of the environment. Long term adaptation results in speciation or evolution; short term adaptation yields the phenomenon of learning. With few exceptions, adaptive evolution involves a gain in structural complexity, measured in terms of negative entropy or information content. The peculiarity of the learning mechanism is, according to Ross Ashby,

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[24] N. Tinbergen, *ibid.*

[25] Ervin Laszlo, *ibid.*, p. 36.

[26] Magoroh Maruyama, "The Second Cybernetics: Deviation-Amplifying Mutual Causal Processes," *American Scientist*, 51, 1963.

> . . . that the gene-pattern delegates part of its control over the organism to the environment. Thus, it does not specify in detail how a kitten shall catch a mouse, but provides a learning mechanism and a tendency to play, so that it is the mouse which teaches the kitten the finer points of how to catch mice.[27]

In this manner behavioral variations become rooted in the individual—learning is not a group but an individual phenomenon. Learning extends the range of biological adaptation into the conscious cognitive realm. It effects a temporary reorganization of the parameters of the organism's essential functions, physiological as well as behavioral. It is in this sense of the word, as Piaget says, that knowledge is a special case of biological adaptation.

The *Umwelt* (life-world) of an individual is a code system just as the genetic structures of the chromosomes is a code system,[28] and codes are information transferring devices. The genetic code is maintained in the DNA molecule; the species-specific cultural code is maintained in the brain structures of individuals. Only in man the cultural code has developed into such complex systems. Moreover, in humans the environmental cue system can be construed artificially within the mind of the individual through the mediation of language and internal codes, i.e., concepts. Thus, through the code of language humans learn another code, the code of behavior which anthropologists call culture. It was Leslie White's thesis that culture is an extra-somatic adaptation.

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[27] W. Ross Ashby, *ibid.*, p. 234.

[28] Alexander Alland, Jr., *Evolution and Human Behavior* (New York: The Natural History Press), 1967.

The method of adaptation by learning is the only way of achieving adaptation to environmental pressures which are constantly in flux. Evolutionary adaptation is suited for the more permanent features of environmental variety. However, only individual adaptation, in the form of transactive learning processes, is adequate to accommodate to what is constant for too short a time for adaptation of the gene-pattern to be achieved. The organism can process the information that comes to it not only by the genetic mechanism; supplementary information supplied by the environment can be adapted to through learning. Thus, the total adaptation exceeds the quantity of information transmitted directly through the gene-pattern. Biological evolutionary processes describe gradual adaptive changes in the species so that they are becoming better equipped to deal with their (changing) environment. Learning processes, on the other hand, describe rather rapid adaptive changes in the individual organism so that it becomes better equipped to deal with its (changing) environment.

Adaptation may occur when uncertainty arises with respect to the acquisition and state of any or all of the types of knowledge (designative, prescriptive and appraisive) conceived by Charles Morris.[29] Adaptive behavior is made possible if the individual knows "what is" (for which he must engage in designative inquiry), if he knows "what to do" (prescriptive inquiry), and if he knows "what is wanted" (appraisive inquiry).[30] Learning is the outcome of the transactions of learning systems with the displays (teaching functions) controlled by the constraints of the adaptive capacities of the learner.

(3) The third kind of systemic adaptation is called "dual functional-structural adaptation: with respect to subsystems (adaptation as systemic whole) and suprasystems (adaptation as co-acting part)." Laszlo refers to dual functional-structural adaptation with the notion of "holon property," a term he borrowed from Arthur Koestler. A system coupled to an environment (also a system), adapts to this environment, i.e., the system increases in structure, complexifies and acquires new functional properties *vis-à-vis* the environmental system to which it adapts. On this new level of structural-functional organization, the system, considered as an ordered whole, may now be seen as a system of subsystems. Thus, systems function on various levels as suprasystems composed of subsystems in an ever increasing hierarchy of complexity. Through processes of mutual causality systems evolve and assume new identity (such as in the process of speciation), synthesized from its

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[29] Charles Morris, *Signification and Significance* (Cambridge, Mass.: The M.I.T. Press), 1964, 1970.

[30] F. L. Brissey, "The System of Education," Unpublished Paper, November 1968.

subsystems. The more complex a system, the more it tends to increase in unstable state, the higher its range of dynamic functions, and the greater its diversification of properties.[31] And the more complex a system in terms of its intra- and intersystemic hierarchies, the more rapidly a system tends to evolve onto again higher levels of complexity. The implication of the above paragraph for the instructional system lies in the recognition of the fact that the function of instruction cannot be reduced to teaching theories or learning theories. A learning system coupled to a teaching system becomes a system in its own right. Specific learning functions cannot be understood apart from their instructional environment. An instructional situation is a specific learner transacting with a specific teaching environment (including teacher and display characteristics). The transactions between learners and environment are of three types: 1) individual learning from displays (acquiring information), 2) learning from exemplary models (acquiring skills), and 3) learning from interactions with specialists or peers (acquiring social characteristics).

Summary

It has been noted that the teaching system—by manipulating input information of environmental variety contained in a teaching display—exercises control over the output information of behavioral variety of the learning system. The parameters of the instructional theory are determined by the operations which the entire system is capable of performing. Certain assumptions are thereby made about the communication mechanisms which characterize the learning and teaching systems.

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[31] See figure three in Ervin Laszlo, *ibid.*, p. 46.

An instructional subsystem (learner) is capable of learning if it has a mechanism for

a) scanning information contained in stimuli;

b) processing information: encoding (chunking, organizing, storing), recoding (reorganizing) and decoding (retrieving) information;

c) being aroused into a state of uncertainty—motivational readiness to learn—when presented with information that contains (relative to the learner) some maximum level of novelty and some minimum level of redundancy;

d) executing taskplans which have been formed or adopted by the learner to reach a set goal.

An instructional subsystem that is capable of teaching must have a mechanism for . .

a) generating information;

b) transforming coded information (concepts) into behavioral rules and rules into task-objectives (and vice versa);

c) establishing communication channels with learning systems;

d) determining the system state and structure characteristics of a learning system;

e) measuring or assessing via feedback loops the optimal channel capacity of a learning system with respect to determinate units of coded information contained in specific taskplans;

f) inducing a state of (cognitive) uncertainty in the learner—which essentially amounts to a state of (motivational) readiness.

This outline contains at least two obvious implications for teaching:

(1) Teaching is an activity designed to aid the individual in gaining control over features of his environment and his own actions in relation to his environment.

(2) Manipulation of the environmental contingencies is constrained by the level of learner control already achieved.

Systems, States and Structures

Since instruction is a function characteristic of the entire system, it can be described in terms of all the structural components that are subsumed. Generally, instruction can be defined as a function of all relations holding among the elements of the teaching system and the elements of the learning system. A system is always defined by a set of variables. The term *system* refers, therefore, to an abstraction. The learning system refers to an abstracted concept of the learner, not to the 'real' learner or student.

Instruction can be conceived as a system consisting of two basic subsystems: the teaching system and the learning system. A theory of instruction is conceived as a systematically related set of propositions which express, and specify into variables, relations holding among variables operating in the teaching system and variables operating in the learning system. Relations among system variables constitute constraints which can be conceptualized as special laws of the instructional system. Cybernetically, constraints are characterized as regulatory and self-regulatory processes, while heuristically these constraints are conceptualized in terms of the three principles of motivation, orientation and adaptation. Each principle states a lawful relationship among variables.

Constraint is defined as a relation between two sets, and it occurs when the variety that exists under one condition is less than the variety that exists under another. Ashby[32] points out the significance of constraints in cybernetics: systemic constraints constitute scientific laws. On the one hand, constraint is an essential characteristic of a learner's physical, social and psychological environments. And on the other hand, constraint is at work in the selective manner in which a learner operates upon the symbolically mediated information about his physical, social, and psychological environments.

The structure of the instructional system is defined as the totality of the relations holding among the teaching and learning subsystems. The subsystems, teacher and learner, can both be specified in terms of their variables, the state of the system as *a particular combination* of all the variable values, and the structure of the system in terms of *all* the relations on the variables together with the values of the relations.

Both the teaching system and the learning system have many possible states. A teaching-learning cycle describes a sequence of states (a transformation) which follows a certain trajectory or line of behavior through time. The structure of the learning system also changes, that is, the system learns. However, this is a complex function of the internal state of the system, the state of its relevant environment (i.e., the teaching system) and the relation between these two. It appears that one of the main problems in a theory of instruction is situated in the difficulties of identifying those variables, their values and relations that best describe the state of the system and particularly all the relations on the variables and their values that constitute the structure of the system.

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[32] W. Ross Ashby, *An Introduction to Cybernetics* (London: Chapman & Hall Ltd.), 1961.

It appears that the essence of an instructional system and its subsystems is 'change of structure.' Teaching deals with changes of task and display characteristics. And learning involves changes of the cognitive make-up and associated behaviors of the learner. In a quantitative model of instruction all these changes can be measured directly or indirectly. Cognitive structures are brought about by transformations which describe ontogenetic or epigenetic processes. These can be observed (indirectly) through behavioral changes in the learner.

All systemic structures are transformations, that is, outcomes (or, rather, 'moments') of change. The point is that some changes occur rather rapidly (e.g., the building of artificial brains) while others take place almost imperceptibly (e.g., evolutionary processes in biological brains). Some systems, such as computer models of learning are artificial and subject to manipulation and control. Other systems are natural and cannot usually be changed by man. Thus, some of the parameters of the instructional subsystems are natural rather than man-made and therefore difficult or impossible to change. Examples of invariant parameters in the instructional system are the cortical structures of the brain (a biological system), or the environmental constraints (physical structures) inherent in any reference object of a teaching display. The biological structures of the brain are the result of phylogenetic or biogenetic transformations which reflect the development of man as a species. Scientific study of the brain and analysis of its functions do suggest ways of improving our predictions of actual learning outcomes. But little or nothing can be done yet to change the biological processing mechanism of the brain itself. Similarly we can change and improve the adequacy of our concepts, models, and theories of the world. But we cannot change the constraints inherent in the physical referents of displays. That is, we can change our coding or interpretations of the information which environmental objects and events yield us, but we cannot alter the nature of stimuli itself. This is, therefore, the invariant parameter of every epistemology.

For learning to take place the system is engaged in effecting change in the mapping of its own cognitive/affective structure, whether this simply means storage of new information or reorganization of existing configurations. These changes cannot be detected through immediate feedback instruments (such as formative and summative testing-devices). Some variables such as attitudinal factors and relatively stable belief systems may display what Ashby[33] calls "step-function." These variables stay relatively constant up to a point whereafter they suddenly change value. This means, critical stages in any main variable of the system may result in a change of a step-function. Variables that do not change at all possess null-functions; those that show constant variation have full-functions; and variables that change periodically demonstrate part-functions. Some structural variables of the learning

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[32] *Ibid.*, p. 242.

system can only be studied as independent variables since they are unchanging, such as some characteristic properties of the brain for example. Other main variables such as the learner's ability to perform logical operations do not change automatically but when they do change (for example as a result of instruction) they have been found to bring about dramatic changes in other cognitive skills or problem solving abilities. Thus, we speak about 'transfer.' Some structural variables change with maturation as is the case in the theories of cognitive growth, exemplified in the developmental schemes of J. Piaget, Vygotsky and J. B. Carroll. Other main variables undergo relatively little change although they may differ in weight from person to person as is the case with Bruner's constructs related to selection strategies of concept acquisition—conservative focussing, focus gambling, and successive scanning.

The state of the learning system can be described in terms of a conditional readiness to act (upon information contained in the display). The conditional readiness has motivational implications. The arousal/tension-action-reduction sequence seems to describe what happens in a large number of instances of motivated behaviors. The motivated individual displays a state of increased tension or arousal brought about in response to some situational stimuli (information) and constrained by certain internal (phylogenetically and ontogenetically mapped) structures. The whole system can be at a state of equilibrium only "when each part is itself at a state of equilibrium in the conditions provided by the other."[34] Disequilibration in the motivational system activates the learning system to orientate itself 'cognitively' and 'affectively' to its environment. In fact, in learning situations of the S-O-R type, tension may be brought about by processes variously described as cognitive dissonance, imbalance, and incongruency; this in turn leads to a reduction in the state of increased arousal or tension of the system. Problems which are subjectively felt as cognitive 'dissonances,' 'incongruencies' and so on, involve the orientation of the individual toward himself, toward others, and toward environmental objects. In general, a state of readiness of the learning system can probably best be described cognitively in terms of some optimal level of intellectual uncertainty. Berlyne,[35] for example, has conceptualized curiosity as a response (state) to uncertainty and ambiguity. Of course, too much confusion and anxiety associated with uncertainty may block or obstruct a learner's readiness state. An important distinction therefore must be made between the (behaviorally) inactive and active variations of 'affective states.' All kinds of different cognitive involvements have been grouped under the label of the affective domain. One particular important source of confusion is associated with the indiscriminate use of the concepts 'motivation' and 'emotion' (including related or subconcepts such as feelings, fear, joy, shame, and guilt).

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[34] *Ibid.*, p. 233.

Emotion and Motivation

In an article entitled "Adrenalin Makes the Heart Grow Fonder"[36] its authors present an account of Stanley Schachter's thesis. Before a person can experience any specific feeling and engage in motivated behavior produced by love, anger, fear, etc., he first must undergo a general state of physiological arousal and, further, he must be placed in a proper environment that enables him to interpret his subjectively felt state of emotional arousal into a specific experience. It seems that any high state of arousal, regardless of how it has been brought about, can inspire (become translated into) strong and very specific emotional reactions, depending on the nature of the situation in which one finds himself.

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[35] D. E. Berlyne, *ibid.*

[36] Elaine Walster and Ellen Berscheid, "Adrenalin Makes the Heart Grow Fonder," *Psychology Today*, 5, No.1, June 1971.

Hebb pointed to a similar concept in the distinction he made between the arousal function and the cue function of a sensory event. Without the foundation of arousal or vigilance, the cue function cannot exist. Arousal is synonymous with a general drive state: "no arousal, no learning; and efficient learning is possible only in the waking, alert, responsive animal, in which the level of arousal is high."[37]

The term 'emotion' refers to a neuro-psychological state of stimulation or activation which does not result, however, in related behavioral actions. Pribram has cited ample neurophysiological data[38] which seem to suggest that the state of emotion must be conceived as involving processes of 'taking the organisms out-of-motion.' It appears that emotion is characterized by a (sometimes very high) inner sensation of involvement without, however, the ability of providing an outlet for this involvement in the form of motivated behavior; that is, behavior which carries forward some kind of plan or program. Thus, effecting in a student a state which is charged with emotion is not the same as inducing in the student a state of motivation. Emotion is characterized by 'inactivity' or otherwise 'non-directed behavior' associated with sometimes extreme psychological states such as hysteria, wild panic or uncontrollable joy. Motivation, on the other hand, refers to the conversion of cognitive stimulation which has 'effected' the student into some sort of action guided by a cognitive plan. Pribram suggests that emotion expresses the relationship between perception and action, i.e., that emotion relates information processing and control mechanisms, image and plan.

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[37] D. O. Hebb, *ibid.*, p. 182. ✓

[38] K. H. Pribram, "Emotion: Steps Toward a Neuropsychological Theory," *Brain and Behavior*, 4 Vols., *Adaptation*, Vol. 4, ed. K. H. Pribram (Harmondsworth, Middlesex, England: Penguin Books Ltd.), 1969, pp. 262-263.

Structures and Transformations

The theory of instruction assumes that information processing is the mechanism through which an instructional subsystem orientates itself toward its environment. In determining how an individual sees himself and his environment, the concept of information may be described in terms of three kinds of transformations: logical structures, psychological structures, and behavioral structures.

Information of environmental variety may be said to consist of 'coded or logical' structures. The manner in which these logical structures become processed or encoded into the brain and thus gain affective significance (they 'affect' the person) is conceived as 'psychological or cognitive' structures. And, finally, the way in which this information is decoded into behavioral rules we come to speak of as 'behavioral structures.'

Logical structures of the display. The logical structure of some displays is determined by the way in which the elements of the displays are related to one another. A display that does not consist of random elements may be said to exhibit or subsume some logical structure which can be conceived as an objective body of knowledge (objective, because the structure of the display is accessible to a third person, that is, it can be communicated). The information contained in such a teaching display poses for the student some (potential) epistemic problems. Epistemic problems typically deal with "what is" questions about the physical or social world. And generally, the best systems for analyzing systemic problems are those of scientific theory. For example, the display may present a verbal text or show a graph comparing the average monthly precipitation in British Columbia and Alberta. Thus, meteorological principles may be expected to account adequately for precipitation phenomena associated with climatical or weather systems. The theory of geographical meteorology consists of sets of statements which systematically relate concepts of precipitation to barometric pressure areas, altitude, physical barriers, air currents, and so on.

Logical structures could possibly be expressed in terms of the likelihood that one concept is related to another concept for a user of some specific language of discourse. What are the boundary conditions of the conceptual systems that make—within social science discourse—one concept relation more likely to occur than another concept relation?

For example, the question may be: What is the likelihood that the notion 'relative poverty' is associated with the concepts of 'communism,' 'socialism,' or 'capitalism'? It seems then, that 'relative poverty' is more likely associated with either 'capitalism' or 'communism' than to 'architecture' and again more to 'architecture' than to 'thermodynamics.'

It appears that concepts are elements in general systems of relationships. Instances may be recognized by submitting them to some test procedure or set of procedures. It may be, however, that neither the test procedures nor the structural rules of the conceptual system are clear to the person who possesses the concept.

Psychological structures. Whereas the epistemic or the logical structure of conceptual systems is described by determining the objective logical relations among concepts as found in (scientific) statements, the cognitive or psychological structure of conceptual systems may be compared with an internalized system of rules that enables a meaningful interpretation of some display. Pribram looks upon the nervous system as a magnificent instrument for efficient coding. And he suggests that knowledge may very well be seen as a function of the brain's coding operations.[39] Says Pribram, "I believe that coding operations are central to what we call 'knowing.' I might even go so far as to suggest that knowing is coding."[40]

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[39] K. H. Pribram, "Neurological Notes on Knowing," *The Psychology of Knowing*, eds. Joseph R. Royce and Wm. W. Rozeboom (New York: Gordon & Breach, Science Publishers, Inc.), 1972, p. 460.

[40] *Ibid.*, p. 452.

The mentalistic notion of concepts and conceptual structures are represented by assumed internal responses (intermediate transforms) which in turn act as operator rules on operand information contained in new incoming stimuli. The intermediate transforms are assumed to be the cortical mappings—information structurally coded in the neural pathways of the brain—which determine what a person knows, values, and is capable of performing. So a person's cognitive (potential) orientation is expressed in the conceptual systems, making up the structure of his cognitive apparatus. And his active (actual) orientation is situated in the plans[41] and rules for acting which make up the structure of his behavioral transactions and responses.

The various stages in the information processing mechanism can be symbolized in the following schema:

Transformation Rules

operand →	operator →	intermediate transform →	operator →	final transform
logical structures of stimulus information	rules for processing --encoding information	psychological structures of internalized information	rules for acting —decoding information	behavioral structures of response information

The operand information of the teaching display exhibits logical structures. Analyzing these structures is an epistemic problem. The manner in which an individual transacts with the display (the way he

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[41] George A. Miller, Eugene Galanter, and Karl H. Pribram, *Plans and the Structure of Behavior* (New York: Henry Holt and Company), 1960.

'perceives' his world) is greatly determined by the operator rules which he has available. Thus, intellectual operations are conceived as systems of transformation. Whereas the state function of a system refers to the conceptual imagery taken as momentary or static, the operative function deals with transformations from one state to another. And, of course, these operators directly correspond to the person's internalized conceptual structures of information, the analysis of which is a cognitive or psychological problem. The hypothesis of internal equilibration or self-regulation, allows for the construction of cybernetic models of conceptual structures. The conceptual structures of the intermediate transform stands for all the accumulated, organized knowledge a cognitive system has acquired about itself and its environment. It includes all concepts an individual has learned, organized by whatever logical structures or relational rules he has been able to master.

Finally, the operator function of our cognitive structures is assumed to be determinant for the way in which we behave. Knowledge structures affect a person's actions in that behavior becomes governed by rules. Knowledge in the sense of an intermediate transform will affect the behavioral structure of the final transform. And, as Maccia pointed out, instruction is teaching-learning viewed as influence toward rule-governed behavior.[42]

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[42] Elizabeth Steiner Maccia, "Instruction as Influence Toward Rule-governed Behavior," *Contemporary Thought on Teaching*, ed. Ronald T. Hyman (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1971, p. 143.

Behavioral structures. Just as we talk about the structure of a person's knowledge so one may talk about the structure of a person's actual behavior. The first kind of structure is usually indicated by the terms 'conceptual system,' 'cognitive structure,' 'mapped information' and so on. The second kind of structure has been theorized with the terms "Plan"[43] (Miller, *et al.*), "rules for acting"[44] (Kaplan), "behavioral rules"[45] (Maccia, Scandura).

As was indicated above, there seems to exist an obvious relationship between cognitive structures and behavioral structures. But since the existence of cognitive structures cannot be demonstrated to exist other than through introspective accounts or through inference from observable behavior, internal conceptual structures of information remain theoretical entities. Such internally encoded structures of knowledge do acquire some empirical import, however, from recent neurophysiological research on the information processing characteristics of the brain.

It has been suggested that the learner is to be compared with an ultra-stable or self-regulating information processing system that operates on the logical structure of a display by transforming it. This does not mean that the learner is 'copying' the structure of some 'real object' into an 'internal picture' of it. The process involves an operating upon, or transacting with the display; that is, by constructing cognitive systems of transformation which are isomorphic to the structures of environmental variety. The transformation is carried out mentally in the initial information processing (encoding) stage. And the transformation can be carried out behaviorally in the rule governed action stage (i.e., the recoding stage).

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[43] George A. Miller, Eugene Galanter, and Karl H. Pribram, *ibid.*

[44] Abraham Kaplan, *The Conduct of Inquiry* (San Francisco, Cal.: Chandler Publishing Co.), 1964.

[46] Elizabeth Steiner Maccia, *ibid.*
Joseph M. Scandura, "Role of Rules in Behavior: Toward an Operational Definition of What (Rule) is Learned," *Psychological Review* 77, No. 6, 1970, pp. 516-533.

So it is hypothesized that structural analysis may be applied to all behavior including the transactional or internal behavior and output or observed behavior of learning systems. In fact, Miller, Pribram and Galanter have formulated the notion of Plan and the TOTE mechanism that would underlie all behavior of human (and non-human) systems.[46] They point out that all intentional behavior can be analyzed in terms of simple or more complex hierarchical structures of TOTE loops, each consisting of a Test phase to locate the 'significant' elements of the operand; and Operator phase, effecting a transformation upon the operand; another Test phase to check whether matching occurs; and an Exit from the loop. It seems that such TOTE loops may be located in the encoding as well as the recoding stages of the schema on page 98.

Behaviorally TOTE's are conceived to be arranged hierarchically into Plans, "the antecedents of actions." "Structurally Plans are nothing more than programs similar to those that guide the operation of computers."[47] And, as a paraphrased variant, one may say that instructionally Plans are nothing more than taskplans that guide the teacher as well as the learner in the execution of their teaching-learning activities.

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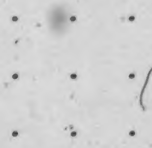
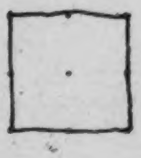
[46] George A. Miller, Eugene Galanter, and Karl H. Pribram, *ibid.*

[47] Karl H. Pribram, "Neurological Notes on the Art of Educating," *Theories of Learning and Instruction*, ed. Ernest R. Hilgard, The Sixty-third Yearbook of the National Society for the Study of Education (Chicago, Illinois: The University of Chicago Press), 1964, p. 90.

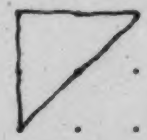
Suppose a teaching display consists of a puzzle illustrating the concept of functional fixity: the figure of nine dots, accompanied by the direction to connect all nine dots with four straight unbroken lines.



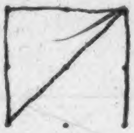
When the student is engaged in transacting with the display he will make use of some plan(s) by means of which he may be able to perform the task behavior, namely, to connect the nine dots with a net of four unbroken, straight lines. He may decide to solve the problem using a pencil, copying the figure of nine dots on a piece of paper and tracing the dots with the pencil. The student may first want to think of the figure as representing a square:



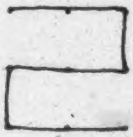
However, there is still one dot left. Now the student traces a triangle formed by six of the dots:



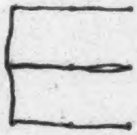
That makes three lines, but it appears impossible to connect the remaining three dots with the fourth line:



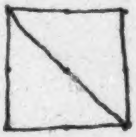
Another attempt leads to the following result:



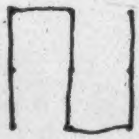
Now the student may decide to start in the middle and to go back over some line he just drew,



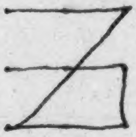
again without the desired result. At this point the student may lay down his pencil and by staring at the original figure of six dots he attempts 'to do the drawing mentally.' For example, he tries to 'imagine' how the figure would look if all the dots were connected. He may actually decide to pick up the pencil again in order to draw the total figure like this, for instance:



Of course this figure has five rather than four straight unbroken lines. So maybe like this:



Again five lines. And the following figure does not work either:



Depending on the strategies of the taskplan which the student constructs for the solving of the problem presented by the display, the student may be successful or unsuccessful in the execution of the set task behavior. Suppose the student is not able to do the puzzle. Now the teacher presents him with a new display exhibiting the solution to the problem and a question, asking the student what he considers constitutes the cause for his failing on this problem solving task. The instructional episode may occur as follows:

Teacher: Why do you suppose that you were not able to do this task?

Student 1: I did not know that I was allowed to go outside the figure.

Student 2: It did not occur to me that you could extend the lines beyond the imaginary square of the nine dots.

Teacher: Of course, there were no directions given which prevented you from extending the lines beyond the square.

Student 2: That's true.

Teacher: Well then, who or what was doing the preventing?

Student 1: I suppose that I was too preoccupied with the geometrical designs enclosed within the nine dots.

Teacher: Could you use a different term describing your preoccupation?

Student 1: eh . . .

Teacher: Could you say you were 'fixated' to the area enclosed by the nine dots?

Student 1: Yes, I guess that sums it up quite well.

In the episode we see the student transacting with information contained in the teacher's verbal behavior (which is also a display). And when the student eventually has come to formulate some answer that describes the idea of "functional fixity" the student has demonstrated that he has attained the concept. The teacher may now wish to test whether this newly acquired (logical) concept of functional fixity will be a (cognitive) factor in a change of rule-governed behavior on a new (behavioral) task.

It was illustrated above how, in carrying out an instructional task, the teacher as well as the student may be said to be led by a taskplan which is further differentiated into strategies and tactics. Generally, a taskplan controls the order in which a sequence of operations is executed. Mager once suggested that, if you give each learner a copy of your objectives, you may not have to do much else. Some teachers have interpreted this literally. However, they failed to perceive an obvious distinction that can be made between taskperformance and taskplan. The first tells *what* task the learner will be able to do; the second spells out *how* the learner will execute the task. A taskplan is the behavioral transform of the student's taskperception which in turn bears close relationship to his cognitive image or knowledge structure and in particular to the cognitive state of the specific situation within which the task is conceived.

There is only one instructional process, adaptation; and one measure, acquisition of 'rules.' The instructional objectives toward which teacher information processing and student information processing are directed are:

(1) Student performance of transactive information behavior leading to supposed acquisition (association and integration) of the information into the learner's hierarchical context. This is assumed to be a mental process permitting the student to extend his behavior repertoire to new instances of rule-governed behavior.

(2) Student performance on defined task objectives giving evidence of rule-governed behavior.

Since the structure of a taskplan is related to a person's cognitive structure, it appears that a taskplan 'belongs to' a person. Different people employ different strategies and tactics for executing the same task. And if problem solving amounts to selecting the proper taskplan from alternatives, it follows that people will vary in their problem solving approaches and capabilities. Moreover, task variables are often time variables with respect to the time it takes for a learner to achieve a specified kind of rule-governed behavior.

Ever since R. W. Tyler, the writing of behavioral objectives has constituted a more rigorous approach to instruction. However, it is misleading to say that instructional objectives should be specified in terms of behavior. As Travers pointed out, one is not interested in the frequency of emission of a particular operant. Outcomes should be specified in terms of task problem situations and task solutions. According to Travers, a useful taxonomy of objectives would involve a taxonomy of tasks.[48] And ideally this taxonomy of tasks would be organized into a system of scales (of subsuming and superordinating tasks).[49] Scale analysis would make it possible to determine which types of performances occupy consistent places in the fulfillment of any task system. An interesting variation on the concept of arranging objectives in terms of task systems is the method of mathetics.

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[48] Robert M. W. Travers, "Towards Taking the Fun Out of Building a Theory of Instruction," *Contemporary Thought on Teaching*, ed. Ronald T. Hyman (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1971, p. 113.

According to Eugene Haddan, mathetics is a systematic method of arranging a unit of instruction (proposed by T. F. Gilbert and elaborated by Robert Gerry) that reverses a major dimension of programmed instruction; sequences and chains are taught backwards.[50] It requires a systematic analysis of the terminal task. Learning by doing is emphasized and it is called a 'transactional' approach. Mathetics starts with the last thing (the terminal behavior) that the individual learns in that sequence. The learner is first taught where he is going and what he will be doing when he has become competent. Each step he takes is reinforcing because it is connected with the final performance. Matheticists claim that their method 1) saves time and lesson space; 2) sustains motivation; and 3) requires a greater degree of involvement.

Questions of Formalization, Explanation and Prediction

The question now is, whether the instructionally relevant notions of uncertainty, context and also the concepts of logical structure, psychological structure and behavioral structure and so on, can be integrated into a set of propositions which state a theory of instruction.

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[49] *Ibid.*, pp. 114-115.

[50] Eugene E. Haddan, *Evolving Instruction* (New York: The Macmillan Co.), 1970, p. 124.

Ideally a theory of instruction should meet the two criteria for the purpose of which theory is usually formulated and a third criterion which is added out of practical interest:

(1) to explain past and present instructional events,

(2) to predict future instructional events (the conditions being specified), and

(3) to serve as a basis for the selection of effective measures of control.

It appears, however, that the explanatory and predictive properties of the theory are closely related to the question of formalization in science. The problem of formalizing a theory of instruction is a problem of establishing logical relationships among the statements which comprise the theory. Only if all derived propositions (theorems) can be demonstrated to follow deductively from all stated assumptions (axioms) can a theory be considered fully formalized. However, most scientific theories (especially in the social sciences) are at best only partially formalized. There are probably two main factors which account for lack of full formalization. One factor is associated with the difficulty of identifying and formulating all primitives and defined terms of the theory. The other has to do with deficiencies in the logical structure of theory.

Provided the internal and external conditions of the teaching system and learning system have been adequately specified, one would be interested in assessing the explanatory and predictive significance of the instructional theory. Consider, for example, the following set of statements (a subset of the set of statements pertaining to the whole instructional system). They illustrate an attempt to put functional analysis to explanatory and predictive use.

Example A:

(i) Suppose that, at time t, a system is learning in a learning situation (to be specified in terms of learner characteristics and display characteristics).

(ii) But a system can learn only in a learning situation (as specified) if the system is engaged in transactive information processing.

(iii) Only if the system is in a state of active uncertainty will the system be engaged in information processing.

(iv) Therefore, at time t, the system is in a state of active uncertainty.

Example B:

(i) Suppose that, at time t, a system L is in a state of active uncertainty in a setting of kind C (to be specified in terms of characteristics of learning system, teaching system and display).

(ii) But L will be in a state of active uncertainty only if the system is presented with a display containing information of some maximum level of novelty and some minimum level of redundancy.

(iii) Only if L is characterized by a cognitive structure R (to be specified in terms of conceptual cognitive structures) then, as an effect, the conditions under (ii) would be satisfied.

(iv) Hence, at t, system L is characterized by a cognitive structure R.

Example C:

(i) Suppose that, at time t, and in a setting of kind C (specified in terms of task conditions), system L is performing a behavioral task of structure P.

(ii) But L is able to perform P only if it is characterized by an operator set for rule-governed behavior of type O.

(iii) Only if the system has processed a logical structure of environmental variety D would the conditions under (ii) be satisfied.

(iv) Therefore, at time t, system L has processed a logical structure of environmental variety D.

In the above examples, statements (i) to (iv) have the form of a nomological argument. Statement (i) specifies the conditions, statements (ii) and (iii) form general laws of the instructional system, and statement (iv) would follow logically, just as in a deductive-nomological explanation the *explanandum* follows from the *explanans*. Hempel[51] has pointed out, however, that this type of analysis seldom pertains in social systems (or even in physical systems). One problem is associated with the specification "only" in statement (iii). Can it indeed be assumed that a system can be engaged only in'formation processing (i.e., learning) when the system is in a state of active uncertainty?

Furthermore, in cases of nomological prediction it is usually assumed that the system's boundary conditions are not violated—i.e., that the system is practically 'closed' and not subject to significant outside interference—during the time lapse that the prediction pertains. These boundary conditions are specified in statement (i) in terms of systemic conditions of the learning situation. Another problem, therefore, has to do with identifying the sufficient conditions of a

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[51] Carl G. Hempel, *ibid.*, p. 310.

(classroom) learning situation.

The nature of the law-like assumptions under (ii) and (iii) were elsewhere referred to as equilibrating processes of self-regulation. The laws of self-regulation exhibited by certain systems (especially systems belonging to physics and chemistry) are often subsumed under more general laws of causal form. However, even the laws of self-regulation themselves are causal in the sense that for systems of a specified kind, any one of a class of different states will (with some maximum degree of probability) lead to the same kind of final state. Hempel[52] points out that the hypothesis of self-regulation is not teleological in nature, but rather, that it asserts a tendency or disposition of certain systems to maintain, or return to, a certain kind of state. Thus, it is hypothesized that any state of cognitive uncertainty will, via a stage of information processing, lead to a final tension reduced state. Another problem associated with nomological explanations and predictions is the question of the precise 'meaning' of the terms and statements involved in the *explanans* of the above arguments. The *explanans* must be capable of empirical testing involving suitable observational or experimental procedures. In operationalizing the theoretical terms, the propositions of the theory acquire empirical import: they become capable of tests and thus susceptible to refutation—and this is an essential characteristic of all explanatory and predictive systems.

A distinction is made sometimes between 'systems science' and

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[52] *Ibid.*, pp. 325-329.

'systems technology.' A scientist is interested in understanding "how the environment does in fact work." For this purpose he studies a certain slice of reality 'as a system,' consisting of a limited number of subsystems, system parameters and variables. A technologist, on the other hand, is interested in controlling the environment, i.e., in 'getting the environment to work.' He aims at applying the products of scientific inquiry for finding solutions to problems of systems control. Thus, the scientific achievement of nomothetic prediction and explanation is made use of in practical contexts by the designer or engineer. The question, for the instructional designer is, whether he can expect to gain this type of control in the area of instructional planning and instructional practice. The instructional system is enormously complex. To get a flavor of the nature of this complexity one may wish to look at the research done by Ryans[53] who attempts to identify the multitude of variables that are embedded in the area of teacher characteristics (teaching subsystem). With systems so complex as 'real' learners and teachers, prediction and explanation seem to fall out of reach of the educator who has practical interests. This point has been presented already in the introduction of this study.

From a scientific standpoint, it may be undesirable epistemologically to assume that a system has, in principle, unpredictable properties. Following Skinner,[54] one could point out that if a teacher does not know how a student has achieved a certain task, the teacher attributes the achievement to the student's 'ability,' his 'creativity,' or his 'originality' which thus become explanatory terms for some kind of achieved learned behavior. A quote from Ashby puts these remarks in a systems context.

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[53] D. G. Ryans, *Characteristics of Teachers* (Washington, D.C.: American Council on Education), 1960.

[54] B. F. Skinner, *ibid.*

> It should be noted that as soon as some of a system's variables become unobservable, the "system" represented by the remainder may develop remarkable, even miraculous, properties. A commonplace illustration is given by conjuring, which achieves (apparently) the miraculous, simply because not all the significant variables are observable. It is possible that some of the brain's "miraculous" properties—of showing "foresight," "intelligence," etc.—are miraculous only because we have not so far been able to observe the events in all the significant variables.[55]

A scientist must work on the assumption that natural systems, in principle at least, behave regularly, so that this behavior can be understood in a rational manner, i.e., that this behavior is explainable and predictable. In the scientific reality there are no 'miracles.'

One must admire Skinner for his dogged persistence *qua* scientist to continue to study human behavior 'as if it were predictable.' Indeed, the scientific attitude does not allow him to perceive human behavior otherwise. Similarly, within the cybernetic orientation (cybernetics being viewed as a branch of nomothetical science) there is no room either for terms such as 'creativity,' the 'autonomous' learner, the 'self actualizing process,' the 'inner' or 'real self' of a learner. Skinner explains why this is so.

> The function of the inner man is to provide an explanation which will not be explained in turn. . . . he is a center from which behavior emanates. He initiates, originates, and creates,

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[55] W. Ross Ashby, *Design for a Brain* (London: Chapman & Hall, Ltd.), 1960, p. 114.

> and in doing so he remains, as he was for the Greeks, divine. We say that he is autonomous—and, so far as a science of behavior is concerned, that means miraculous. . . Autonomous man serves to explain only the things we are not yet able to explain in other ways.[56]

We admire people, says Skinner, to the extent that we cannot explain what they do. That is, if we do not know why a person acts as he does, we normally attribute his behavior to him.[57] And elsewhere Skinner remarks:

> Although people object when a scientific analysis traces their behavior to external conditions and thus deprives them of credit and the chance to be admired, they seldom object when the same analysis absolves them of blame.[58]

A cybernetic view of instruction conceives of processes and relations of instruction in terms of causal and mutual causal (feedback) paradigms. For the purposes of instructional engineering, programming or instructional design, the causal paradigms are translated usually in terms of means-end relationships. In order to achieve a specific 'objective' one employs a certain 'means' assuming, of course, that the 'end' can be predicted on the basis of supposedly causal processes underlying the means-end program. Thayer has provided an important critique of the attempts to study 'real' human beings from the frame of reference of communication systems theory. First, there is the fact that human beings are communication systems in a rather special way. In ordinary communication systems, the information exchanges can be measured in terms of identical quantities or "bits." And the information system components can be assumed to be identical from one situation to another. However, a human being is not the same in one communication system as he is in another. Every concrete instructional system is a different one. A learner is not the same 'element' in conversations with one teacher or student as he is with another. Nor is the learner or teacher the same 'element' in processing information in situations as different as the class discussion, tutorials, lecture sessions, private study, and so on. There is always something which is significantly unique about every concrete instructional situation in which teacher and learner participate as 'systems.' With reference to human communication systems, in general, Thayer points out that:

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[56] B. F. Skinner, *ibid.*, pp. 11-12.

[57] *Ibid.*, p. 55.

[58] *Ibid.*, p. 71.

> The components of a human communication system are interdependent in that system in the sense that the only way they can be defined in *that* communication system is in relation to each other. No way of defining them independently of each other can fully explain their behavior in *that* system.[59]

It may seem that instructional theorists and designers, adopting the theoretical cybernetics model have not sufficiently acknowledged this problem. The second issue that Thayer raises is with reference to the fact that human communication systems are *historical*. Or, as it has been discussed in preceding sections, human systems are *epigenetic* in the sense that they continuously change their structure in the process of learning. Says Thayer,

> . . . not only are the components of a particular human communication system never the same in other communication systems; they are never again the same in the "same" communication system.

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[59] Lee Thayer, "Communication Systems," *The Relevance of General Systems Theory*, ed. Ervin Laszlo (New York: George Braziller), 1972, p. 111.

> This is not merely a matter to be accounted for by some stochastic process. People who talk to each other, particularly when they touch upon vital or fundamental communicational realities, change each other, sometimes peripherally, sometimes centrally, but change nonetheless.[60]

Human communication systems in different instructional situations manifest different 'orientations.' That is, in every concrete instructional situation the instructional system is in a 'functional-structural' way uniquely adapted, in the sense that teacher and learners tend to be characterized by a specific code system, as a result of which they 'experience' that situation as a definite reality, involving specific beliefs, values and feelings. Thus, each instructional system is concretely unique in the sense that its subsystems, teacher and learners, are characterized by structural properties that could be referred to psychologically as 'orientations.' Precise prediction of cybernetic adaptive processes becomes, therefore, terribly complicated, if not practically impossible. Maruyama's paradigm of "deviation amplifying mutual causal processes" may be employed to elucidate the way in which the informal curriculum of a specific subject area of instruction tends to materialize in often very unique forms of 'personal knowledge.' For example, Maruyama's unidirectional and mutual causal paradigms could be viewed to underlie the structures of the so-called formal and informal models of curriculum development. Formal curriculum projects reflect the (unidirectional causal) means-end sequences of planning; while in the dynamic reality of the classroom an initial kick-off in terms of some interest engendered in a concrete teacher-learner communication, may lead to things that neither the teacher nor some impartial observer could have 'predicted' from the characteristics of the instructional situation *qua* system.

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[60] *Ibid.*

Throughout the preceding chapters, strengths and limitations of the scientific cybernetic approach—however insightful in a heuristic sense—have been implicitly or explicitly discussed. In the following chapter, the scientific cybernetic approach will be compared to the phenomenological orientation with the purpose of further exploring the possibility of an experience-based (as contrasted to a theory-based) methodology.

Chapter V

CYBERNETIC PHENOMENOLOGY:
A DUAL ORIENTATION

This chapter intends to explore a comparison between the scientific orientation of cybernetics, and the orientation of phenomenology as a philosophy and particularly as a potential mode of inquiry in the phenomena of instructional reality. The attempt is to rediscover the natural world of the classroom without, however, losing the cybernetic framework as an area of inquiry for phenomenological foundation.

The etymological meaning of phenomenology is 'the study of that which appears.' The term derives from the Greek words: *phainomenon* (that which appears) and *logos* (word, science, or study of words). Johann Heinrich Lambert, a German philosopher contemporary of Kant, first spoke of a discipline that he called "phenomenology" in his *Neues Organon* (Leipzig, 1764). He took "phenomenon" to refer to the illusory features of human experience and hence defined phenomenology as the "theory of illusion."[1]

Nowadays, the term 'phenomenology' is used in two distinct senses. In a general context, it is used often to refer to a descriptive type of study of a given subject.[2] In a more specialized sense, it refers to a philosophical movement and to the related epistemological methodology of inquiring into the phenomena of the existential world.

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[1] Paul Edwards (editor-in-chief). *The Encyclopedia of Philosophy* (New York: Macmillan), 1967, Vol. 6, p. 135.

[2] *Ibid.*

Existential thinking, which can be traced back to long before the phenomenological movement, has always carried an undercurrent of hostility toward abstract theorizing which obscures the roughness and untidiness of actual life.[3] More recently, and particularly through the writings of Kierkegaard, the term 'existentialism' has come to refer to the theme of existence, meaning the way in which a single individual experiences his being-in-the-world.[4] This suppressed hostility towards abstracting speculations and established scientific dogma, and the interest in the entire field of experiences, is what is characteristic also of contemporary phenomenology. Hence phenomenology and existentialism are mentioned often in one breath.

The name most closely associated with the founding of the phenomenological movement in the twentieth century is that of Edmund Husserl. He set out to reconcile the *a priori* validity of formal reasoning and psychological processes. His aim to extend the scope of the "*a priori*" to the entire field of experience, led to "pure" phenomenology or what Husserl considered a "rigorous science." Husserl was convinced that the phenomenological method was the only basis on which to construct a genuine scientific theory, since, according to Husserl, only phenomenology can grasp the essence of the subject into which any particular science enquires. In Husserl's view, science was nothing but a distillate, as it were, from the fuller life-world.[5] One could note that on this account there would be no reason to hesitate combining cybernetics and phenomenology in a single orientation toward the study of teaching-learning processes. Phenomenology is seen as the concrete foundation of any scientific system.

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[3] J. O. Urmson (ed.). *Western Philosophy and Philosophers* (New York: Hawthorn Books Inc.), 1965, p. 144.

[4] Herbert Spiegelberg, *Phenomenology in Psychology and Psychiatry* (Evanston: Northwestern University Press), 1972, p. xxix.

[5] Herbert Spiegelberg, *The Phenomenological Movement*, Vol. I (The Hague: Martinus Nijhoff), 1960, p. 162.

While for Husserl phenomenological description was an attempt to go "to the things themselves" and to give a scientifically rigorous account of them,[6] for Merleau-Ponty, phenomenology meant a protest against the objectifying tendency of science and a technique to return to the world as met in lived experiences.[7] This sort of anti-scientific (i.e., anti-naturalistic) attitude is frequently met in phenomenological literature.

Phenomenology can be practised and identified as a manner of style of thinking. However, Spiegelberg pointed out that it is much easier to find agreement among phenomenologists regarding its methodology than it is to have phenomenologists as different as Husserl, Heidegger, Sartre and Merleau-Ponty agree on a definition of the essentials of phenomenology as a coherent system.

Phenomenology is motivated by the assumption that there is more to man than science can elucidate. Science, in its rigorous naturalistic methodology, is not capable of giving a total picture and explanation of man. And this basic view is shared, it appears, by most if not all contemporary phenomenologists.[8] It is true that neither phenomenology nor science by themselves can give a total picture of man. Combined, however, if the pictures will merge, one can expect much more detail. The point is, therefore, not to do away with science or with phenomenology, but rather to pose the question of understanding the meaning and scope of each orientation. And with regard to the study of instruction, the interest lies particularly with the question of how both orientations could converge in a single research methodology.

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[6] Husserl regarded phenomenology as a "rigorous science" in the sense that it possesses logical rigour and is based on a rationalistic attitude. However, the presuppositions of this "rigorous science" are not necessarily identical with "naturalistic science."

[7] Particularly in his first work, *The Structure of Behavior*, and in the preface of *Phenomenology of Perception* Merleau-Ponty criticizes the adequacy of the behavioral sciences for explaining the phenomena of human reality. In his later work, Merleau-Ponty came to see phenomenology and the sciences of man converge. See Herbert Spiegelberg, *The Phenomenological Movement*, Vol. II. (The Hague: Martinus Nijhoff), 1965.

In the preceding two chapters the scientific orientation and the cybernetic view of instruction have been examined. In the following pages, they will be contrasted with the phenomenological orientation. The purpose of this exercise is to arrive at a methodology which will enable a type of instructional research, which benefits from the scientific perspective without losing sight of the primacy of subjectively lived experiences and meanings of instruction as seen and experienced by teachers and learners. For purposes of organization, the following sections are condensed in a list which compares cybernetics as a branch of systems thinking of theoretical science with phenomenology.

Cybernetic Theory	*Phenomenology*
1. The implied ontology is that of the objective reality of the scientific world.	1. The implied ontology is that of the subjective reality of the "life-world" *(Lebenswelt)*.

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[8] Joseph J. Kockelmans (ed.). *Phenomenology* (New York: Doubleday & Co., Inc.), 1967.

2. Cybernetics observes "from the outside."	2. Phenomenology observes "from the inside."
3. As a telic activity cybernetics aims at nomothetic explanation and prediction for technical control of empirical phenomena.	3. As a telic activity phenomenology aims at enlarging and deepening the range of our immediate experience for an increased facility in dealing with these phenomena.
4. Cybernetics is a theoretical science.	4. Phenomenology is a philosophical science (Husserl) and a methodology.
5. Data: sensory observational phenomena.	5. Data: elements of lived experiences; intentional objects.
6. Objects of study are variables, systems, system behaviors and their causal antecedents.	6. Objects of study are consciousness of experience and the structures of the life-world.
7. Employs a scientific language of theoretical terms and propositions.	7. Description is predicated in language and rooted in pre-predicated experience.
8. Ruled by principle of parsimony.	8. Ruled by principle of dialectics.
9. Method: theoretic abstraction and reduction.	9. Method: phenomenological description of phenomena, etc.

The Implied Ontology

There is a different ontology underlying the orientation of cybernetics and phenomenology. The implied ontology of cybernetics is that of the objective reality of the scientific world. The ontological characteristic of the phenomenological orientation is that of the subjective reality of the "life-world" *(Lebenswelt)*. Particularly in Husserl's final thinking—he identified the idea of the *natürliches Weltbegriff* or the *Lebenswelt* as the central theme of phenomenology. The essence of consciousness came to be understood as an act of being conscious in the world of lived experiences. A "life-world" *(Lebenswelt)*, according to Husserl, is to be conceived as an oriented world with an experiencing self at the center. Each life-world shows certain pervading structures or "styles," and they invite study by what Husserl calls an "ontology of the life-worlds."

Thus, one could speak of the typical life-world of the classroom of a teacher or learner. But the life-world of different classrooms, teachers, and learners do not possess the same structure, in an existential sense. This point shall be elaborated on in the next chapter when the notion of orientation is developed as an element of the epistemology of cybernetic-phenomenology.

Merleau-Ponty once defined the world as "the totality of all perceptible things and the thing of all things." But "thing" must not be understood as an object the way physicists or mathematicians use this word, but rather as "the universal style of all possible perceptions." The common research reality of the classroom is perceived in an 'objectifying style.' Even techniques such as interaction-analysis makes use of this style when it categorizes, codifies, and tabulates its data. It appears, therefore, that the phenomenological method is unique in the sense that it does not look at teaching-learning in terms of 'what leads to what' sequences. It is the meaning of our experiences and not the ontological structure of objects or things which constitutes the reality in which teachers and learners act. A teacher does not observe 'behaviors' of learners but 'actions.' When I look at a child doing a particular problem I 'become that child' and I see the problem through his eyes, as it were. A scientific analysis of instruction in terms of teaching-learning relations is to be contrasted with the givens of the existential reality. To view instruction only as an objectified reality would fail to take account of the existential context within which teaching and learning take place.

Observing "From the Outside" or "From the Inside"

Cybernetics observes "from the outside," employing a scientific methodology. Phenomenology uses an orientation which studies instruction from the point of view of the observed, i.e., "from the inside." Experiences are observed as experiences, not as objective facts. While cybernetics describes an objective study (of control, purposiveness, ultra-stability, and functional-structural adaptation) of systems and their internal and external relations, phenomenology calls for a return to the *Lebenswelt*, the world as met in lived experiences. Thus, cybernetic phenomenology constitutes a combination of extreme objectivism (of systems thinking) with extreme subjectivism (of the existential attitude).

In the behavioristic mode, i.e., viewed "from the outside," the mental is reducible to the structure of behavior. Building on Gagne's schema, David Merrill defines all instructional outcomes in a matrix of ten categories of learned behaviors. In order to illustrate what it is like to look at instruction "from the outside," the four hierarchical levels[9] of Merrill's category system shall be considered briefly. The simplest structure is "emotional behavior" (or what Gagné calls "signal learning"), and it is operationally defined as follows:

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[9] These four levels: emotional, psychomotor, memorization and complex cognitive are similar to the distinctions made by Bloom *et al.* between the affective, the psychomotor, and the cognitive domain.

> In the presence of every stimulus situation, a student involuntarily reacts with physiological changes which he perceives as *feelings*. The direction (positive or negative) and the relative magnitude of this emotional behavior can be inferred by observing the student's approach/avoidance responses in unrestrained choice situations.[10]

David Merrill further suggests that practical control of emotional response is feasible by contingency management and behavioral engineering.[11] It is obvious that this type of approach is very compatible with the cybernetic systems model of instruction. Teaching and learning are explained nomothetically in terms of self-regulative or adaptive processes which are characteristic of the behavior of cybernetic systems.[12] 'Feelings' on the part of the learner are reduced to abstract category variables so that learning can more easily be demonstrated, evaluated and quantified. Within the framework of an S-R model the direction and magnitude of learned emotional behavior (i.e., feelings) is seen as the consequence of the reinforcing properties of external contingencies.

The next higher level of learned behavior is termed 'psychomotor behavior':

> Psychomotor behavior occurs when a student is able to rapidly execute, without external prompting, a specified neuro-muscular reaction in the presence of a specific stimulus situation.[13]

Memorization behavior subsumes the preceding categories and is included by the complex cognitive behavior on the highest hierarchical level:

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[10] M. David Merrill (ed.). *Instructional Design: Readings* (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1971, p. 175.

[11] In the same book Lloyd Homme presents an article entitled "Emotional Behavior—A Behavioral Technology," in M. David Merrill, *ibid.*, pp. 185-195.

[12] See also M. David Merrill, "Components of a Cybernetic Instructional System" in M. David Merrill, *ibid.*, pp. 48-54.

[13] M. David Merrill, *ibid.*, p. 175.

> Memorization behavior occurs when a student immediately reproduces or recognizes, without prompting, a specific symbolic response when presented a specific stimulus situation.[14]

Complex cognitive behavior is also defined so that it can be observed "from the outside":

> Complex cognitive behavior occurs when the student makes an appropriate response to a previously unencountered instance of some class of stimulus objects, events, or situations.[15]

Each of the four levels (except the emotional behavior category) is further divided into three subsuming levels, hierarchically arranged. In this fashion Merrill arrives at ten categories (eight of which correspond closely to Gagné's schema) for analyzing learning behaviorally.

It appears that Merrill's category system very neatly demonstrates the objectifying tendency of instructional science. Learning behavior is observed "from the outside." This schema, if further developed, could facilitate the construction of specific educational objectives. The evaluation of learning outcomes would become a matter of preparing an instrument which implements the conditions specified in the objectives and unique to the particular subject matter. After the conditions necessary for the establishment of the behavioral categories are specified, learning behavior can be objectively observed, classified, tabulated and analyzed with statistical models for significant relationships.

The point is, that something has been gained and something has been lost in the process of abstracting the learning experiences which lie at the base of all changes that take place in a person who is learning.

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[14] *Ibid.*, p. 176.

[15] *Ibid.*, p. 177.

The mode of observation "from the outside" establishes a behaviorist vocabulary of learning which would be unintelligible to the teacher if he did not, on an experiential level, understand what 'moves' the learner—whether the learner be animal or human. The problem with a behaviorist attitude is that it is difficult, if not inappropriate, to apply it to a concrete instructional context. Instructional designers require from teachers that they plan, observe, and evaluate students in an objective mode. That is to say, they ask the teacher to substitute his natural and spontaneous orientation as a human being, who acts and lives with his students in a shared world of ideas and experiences, for an orientation that is typical of the scientist or scientific engineer.

Becoming aware of feelings, ideas and ways of acting that one did not possess before is the acquisition of an orientation toward one's self, others and the world that consists of an intricate interplay of experiences of which we may become conscious through a process of reflection. The point can be made that experiences cannot be objectified in the way *things* can be objectified. Acts of consciousness can be grasped correctly only by being 'lived.' The categories of behavioral teaching-learning theories are abstractions and form in some sense an artificial structure with reference to the world of our original experience.

Looked at from the outside, "emotional behavior is inferred by observing the student's approach/avoidance responses." However, the presupposition is that we know how to recognize certain feelings, thoughts and frustrations of the learner. Polanyi referred to this social knowing of another person's (or animal's) experiences as "conviviality."[16] This particular technique of partaking in another being's orientation is at the center of phenomenological method. Merleau-Ponty described the idea of "knowing the other" in relation to "knowing the self." Both kinds of knowing share similar problems.

> . . . another person is in principle accessible to me as I am to myself. But just as I can be mistaken concerning myself and grasp only the apparent or ideal signification of my conduct, so can I be mistaken concerning another and know only the envelope of his behavior. The perception which I have of him is never, in the case of suffering or mourning, for example, the equivalent of the perception which he has of himself unless I am sufficiently close to him that our feelings constitute together a single "form" and that our lives cease to flow separately. It is by this rare and difficult consent that I can be truly united with him, just as I can grasp my natural movements and know myself sincerely only by the decision to belong to myself. Thus I do not know myself because of my special position, but neither do I have the innate power of truly knowing another. I communicate with him by the signification of his conduct; but it is a question of attaining its structure, that is of attaining, beyond his words or even his actions, the region where they are prepared.[17]

More on phenomenological methodology shall be discussed elsewhere in this and later chapters.

Cybernetics and Phenomenology as Telic Activities

A cybernetics of instruction and a phenomenology of instruction have different aims. Cybernetic theory aims at nomothetic explanation and prediction. A practical implication of this orientation is that the teacher, the instructional designer or the instructional programmer can apply the theory to manipulate teaching-learning processes. Thus, he gains control over the process of instruction.

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[16] Michael Polanyi, *Personal Knowledge* (Chicago: The University of Chicago Press), 1958.

[17] Maurice Merleau-Ponty, *The Structure of Behavior* (London: Methuen & Co., Ltd.), 1942, 1965, p. 222.

Furthermore, theories serve both as ends and means in the development of a scientific concept of instruction. Theories as ends aim for explanation, prediction and control; theories as means serve the function of research tools, bringing order into concepts, relating phenomena and events, and suggesting hypotheses for testing.

Phenomenology has a different orientation. The first objective of the phenomenological approach is, according to Spiegelberg,[18] the enlarging and deepening of the range of our immediate experience. In the same context we find Husserl's "To the things themselves." Phenomenology aims at describing the "essence" of the phenomena of the world of lived experiences. The implicit assumption seems to be that the resultant phenomenological studies allow for an increased facility for an understanding of and a dealing with these phenomena. Phenomenology, according to Merleau-Ponty, tries to give a direct description of our experience as it is, without taking account of its psychological origin and the causal explanations which the scientist may be able to provide.[19]

What are the implications of these two aims for the study of instruction? It has been noted that educators have become exceedingly committed to the methodological principles of theoretical science. Eminent authors such as Robert Glaser, Robert M. Gagné, Lee J. Cronbach,

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[18] Herbert Spiegelberg, *ibid.*, Vol. II, p. 656.

[19] Maurice Merleau-Ponty, *Phenomenology of Perception* (London: Routledge & Kegan Paul), 1946, 1970, p. vii.

M. David Merrill, Lawrence M. Stolurow and many others, share a "dedication," to quote from a recent book of readings on Instructional Design, "to the idea that instruction can be planned and studied according to scientific principles."

In current theorizing, instruction is viewed as the "process whereby the environment of an individual is deliberately manipulated to enable him to learn to emit or engage in specified behaviors under specified conditions or as responses to specified situations."[20] Instructional design is the "process of specifying and producing particular environmental situations which 'cause' the learner to interact in such a way that a specified change occurs in his behavior."[21]

Thus, the teaching-learning process is conceptualized in terms of implicit 'means-end' or 'causal' sequences. It involves 1) an assessment of the state of nature of the learning system, 2) goal setting, 3) selecting the appropriate tactical operations, 4) measuring the outcomes. A final stage includes an evaluation of the quality of the end product by comparing it with the input of the instructional system. Although most theorists of instruction acknowledge the fact that instructional processes are rather complex, and really cannot be fitted to linear or closed loop models, they nevertheless adopt such models as a basis for describing the lawfulness of phenomena of instruction. The underlying assumption of this view is that objectives can be regarded as products of an input-process-output-system; i.e., specifiable behaviors are elements in a deterministic network of identifiable causal or functional relations. In a sense it is accepted implicitly by these authors that the instructional process is sufficiently understood, that objectives as they are phrased, are indeed the outcomes of the instructional process. In other words the assumption is that behaviors can be manufactured, and that this is instruction, i.e., teaching-learning.

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[20] Stephen M. Corey, "The Nature of Instruction," in M. David Merrill, *ibid.*, p. 6.

[21] M. David Merrill, *ibid.*, p. 1.

One problem associated with specifying behavioral objectives is that instruction becomes focussed mainly on the testable. Thus, the instructional relationship between teacher and student becomes objectified and detached, orientated at producing empirically testable results. The point is that instruction is more than that. Some existential relationship between teacher and student must be established if learning is to be experienced meaningfully. Teaching-learning happens on the level of meaningful experiences, not on some non-personal systemic level.

Instead of defining 'objectives of instruction' primarily as 'planned outcomes,' they could be viewed rather as manifestations of modes of being-in-the-world, that is, as typical transactions or dialogues of the learner with aspects of his relevant environment. A phenomenological study of the meaning of objectives could be executed as they are embedded in the flow of teacher and/or learner experiences during some instructional episodes. The best way of determining the nature and success of instructional objectives is not necessarily to measure them in terms of input-output variables of the instructional process. Rather, a structural analysis of the transactional dialogue, i.e., of instruction as a complex of experiences, could reveal the conditioning aspects of the instructional situation, including the intended and incidental outcomes. The teacher could do such a study but so could the learner (particularly if the learner himself is an educator). When a third person undertakes such a project, then he would want to record carefully the instructional interactions he observes.[22] Verbal and non-verbal communications would have to be clarified painstakingly in order to trace as precisely as possible the meanings of the sent messages and the way in which they were interpreted. A technique that could be used for this purpose has been called 'ethnomethodology' and was developed by Harold Garfinkel.[23] In this way some light might be thrown on the existential meaning of instructional objectives. The investigator would like to know how a teacher writes an objective, how the objective functions during the teaching-day, how it changes, how it figures in the teacher's thinking and in his general field of relevancies. Phenomenology aims at describing an instructional objective in its 'typicality,' as an example of the kinds of objectives that figure in the lived reality of teaching-learning experiences. If it is a good description it will strike a 'responsive chord' and possess practical implications and consequences.

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[22] Questions of phenomenological methodology are addressed in later paragraphs.

[23] Harold Garfinkel, *Studies in Ethnomethodology* (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1967.

In a transcendental[24] phenomenology the essence of any 'thing' is contained in the experience of that 'thing.' Proceeding to the sources of immediate experience, the aim is to make the reflection as 'radical' as possible. Thus, the proper subject of investigation is the act of consciousness wherein the 'objective' appears to me as a teacher. I become aware of what an 'objective' is essentially, not so much by examining the various definitions offered by curriculum specialists but 'in living my awareness of it more deeply.' Rather than assuming that instructional processes are clear and controllable through the means of ideally specified objectives, one could assume that instruction is essentially a mysterious (i.e., a lived) process which can at best only partly be revealed through painstaking description.

Cronbach hints at a related methodological issue. In allowing for individual differences "the teacher adapts instructional method to the individual on both the micro and macro scales."[25] "I know of no research on impressionistic adaptation of instruction," says Cronbach.

The point could be made that "the methodology of natural science pushed to its logical conclusion leads to the method of behaviorism" in the social sciences.[26] And behaviorism as an objective scheme of reference in the social sciences has as its chief purpose, to explain in a scientifically correct method what really happens in the world of instructional reality. No doubt man viewed as a 'system' shares with other physical and biological systems certain characteristics of lawfulness and predictability. But the cybernetic systems model describes behaviors which are isomorphic to human behaviors only if considered from a cybernetic or systems view.

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[24] "Transcendental" refers to a purely reflective point of view, attending to the experiencing of an object rather than to the object itself.

[25] Lee J. Cronbach, "How Can Instruction be Adapted to Individual Differences," in M. David Merrill, *ibid.*, p. 143.

[26] Alfred Schuetz, *On Phenomenology and Social Relations* (London: The University of Chicago Press), 1970, p. 266.

While on a systems level it is legitimate to aim at the construction of scientific propositions that explain and predict on the basis of supported lawful relations, neither teacher nor learner views his own behavior as the product of causal agencies. There is a difference between behaviors and actions. And this difference may be seen in the epistemological distinction between science and philosophical anthropology.[27] It is interesting to note that 'behaviors' can be planned in the form of instructional objectives, and these 'behaviors' can then be 'elicited' and 'measured' or 'tested' with some instrument or evaluation device. However, 'actions' do not fit in this theoretic design. Seen from the 'inside' people do not *behave* but *act*. Behavior is a concept reminiscent of the movements of physicalist variables which can be classified and assigned a value on a scale. Behavior is a link in a causal or functional chain: it has antecedents and determinants. Actions are intentional, goal directed, or aimed at something; they always reflect a plan. And in the words of Merleau-Ponty:

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[27] Merleau-Ponty denies to philosophy the right to go beyond phenomenological description to "explanations": "To my mind this is the philosophical attitude. Philosophy is amazement *(thaumazein)*, the consciousness of strangeness *(étrangeté)*. It means to suppress 'philosophical' explanations by systems." Maurice Merleau-Ponty, *ibid.*

> In the scientific study of behavior, one must reject every notion of intention or utility or value as subjective because they have no foundation in things and are not intrinsic determinations of them.[28]

Now, in spite of the above mentioned distinctions, the literature also seems to suggest that cybernetics and phenomenology articulate common interests. For example, in both the cybernetic and the phenomenological scheme the notion of 'purpose' has been made a central theme. Thus, it appears that system theorists and philosophers of science have with some success reconceptualized the notion of 'purpose' in order to rid it of its teleological bias. Through a series of articles, Walter Buckley[29] documents the debate between the systems proponents Arturo Rosenblueth, Norbert Wiener, and Julian Bigelow and the philosopher Richard Taylor about the question of whether purposeful behavior in human beings and self-regulatory mechanisms in machines possessing feedback are any different. One of the eight criteria for distinguishing between purposeful and non-purposeful behavior is remarkably reminiscent of the popular behavioristic definition of instruction quoted earlier in this section. According to Rosenblueth and Wiener,

> . . . purposeful behavior is to be attributed only to an object which forms part of a large system, i.e., to an object that is coupled to other objects or features in the environment in such a manner that changes in these objects or features will modify its behavior.[30]

Cybernetics aims at a naturalistic explanation of man and its methodology in the social sciences is clearly behavioristic. In the words of the systems theorists:

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[28] Maurice Merleau-Ponty, *The Structure of Behavior* (London: Methuen & Co., Ltd.), 1942, 1965, p. 9.

[29] Walter Buckley (ed.). *Modern Systems Research for the Behavioral Scientist* (Chicago: Aldine Publishers, Co), 1968.

[30] *Ibid.*, p. 236.

> We believe that men and other animals are like machines from the scientific standpoint because we believe that the only fruitful methods for the study of human and animal behavior are the methods applicable to the behavior of mechanical objects as well.[31]

This statement concerning the central theme of cybernetics, namely "purpose, self-regulation, and self-direction," has obvious implications for all those contemporary theoretical formulations of instruction which are based on the premises and structure of the cybernetic model. It means that if these theories are followed to their logical conclusion, then there is no room for phenomenological terminology. But the way in which 'objectives' and 'goals' of instruction are experienced by teachers, acting in the reality of live classrooms, includes more than the concept of 'purpose' or 'teleology' viewed as 'final cause.' The behavior of two different things, such as target-seeking missile and a goal-seeking man, may be significantly alike if regarded as uninterpreted 'behaviors.' However, translated onto the level of the concrete world of lived experiences, human purposes and actions acquire existential meanings subjectively experienced as 'desires,' 'strivings,' 'pursuits,' 'endeavors to reach,' 'involvements,' 'frustrations,' 'satisfactions,' and so on. In his book *Action and Purpose*, Richard Taylor[32] establishes the necessity for the subjectively experienced concept of purpose in the attempt to understand human nature and human action.

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[31] A. Rosenblueth and Norbert Wiener, "Purposeful and Non-Purposeful Behavior," in Walter Buckley, *ibid.*, p. 237.

[32] Richard Taylor, *Action and Purpose* (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1966.

It is clear that the different interpretations of 'purpose,' 'goal-seeking' etc., require different modes of observation, and different methodological aims. One cannot observe actions in the same way as one observes behaviors. Alfred Schuetz[33] rebutted Ernest Nagel and Carl Hempel for their intolerant stance on the "postulate of the subjective interpretation" as a legitimate mode of observation for a social scientist. On the contrary, says Alfred Schuetz, we want to understand social phenomena and "we cannot understand them otherwise than within the scheme of human motives, human means and ends, human planning—in short—within the categories of human action."[34] The social scientist must therefore always be in the position to ask what happens in the mind of an individual whose actions have led him to certain phenomena.[35] Phenomenology is not anti-scientific; it simply is not orientated toward the discovery of nomothetic, causal, or theoretical patterns, i.e., networks of lawful relationships among variables. Thus, it is not in the attempt of developing nomothetic propositions that phenomenology may contribute but it is exactly in the area of human purpose and actions that it can be applied.

As a final statement to this excursion, one would be inclined to conclude that phenomenology has a legitimate aim in the description of instructional reality. On the level of lived experiences it may render existentially meaningful cybernetic terminology—such as adaptation, uncertainty, information, transactions, content and context relevancy —which are used on the level of scientific theory for purposes of nomothetic explanation, prediction and control. An attempt must be made to reach the reality of teaching-learning phenomena as it is immediately given in primordial experience of the teacher and learner.

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[33] Alfred Schuetz, "The Problem of Rationality in the Social World," *Collected Papers*, Vol. II. (The Hague: Martinus Nijhoff), 1970, pp. 64-88.

[34] *Ibid.*

[35] Richard Taylor, *ibid.*

Cybernetic Phenomenology: Theoretical versus Philosophical Science

Cybernetics may be viewed as a theoretical or applied science, based on a naturalistic or realistic world hypothesis; that is, based on the belief that the real structure of the world can be discovered by employing scientific methods. Phenomenology, in its more recent conception, has been referred to as a propaedeutic science (Stumpf), as a philosophical science (Husserl), as philosophy (Merleau-Ponty), as an epistemic methodology to arrive at pure phenomena (Lauer), as a science of examples (Van den Berg), and so on.[36] More generally, phenomenology is a special way of thinking which puts man's existence, his experiences at the source and at the center of all inquiry.

Husserl's aim was to "discover a new scientific domain."[37] But his "philosophy as a rigorous science" was not based on the naturalistic attitude, nor did it make use of the methodology of the theoretical sciences. In his discussion on the phenomenological *"epoché"*

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[36] A good way to trace the various concepts of phenomenology is through the excellent historical studies of Herbert Spiegelberg, *ibid.*, Vols. I and II.

[37] Edmund Husserl, *Logical Investigations* (London: Routledge & Kegan Paul, Vols. I and II), 1900, 1970, pp. 289-341.

(the method of bracketing), Husserl points out how phenomenology relates to science. He first explains how the *"epoché"* applies to the natural world (what later came to be called *Lebenswelt*). In the *epoché* our entire attitude toward this natural world is put in brackets; although this world, as Husserl says, remains "like the disconnected outside the connexional system."[38] Husserl explains,

> I do not deny this "world," as though I were a sophist. I do not doubt that it is there as though I were a sceptic; but I use the "phenomenological epoche," which completely bars me from using any judgment that concerns spatio-temporal existence (Dasein).
>
> Thus, all sciences which relate to this natural world, though they stand never so firm to me, though they fill me with wondering admiration, though I am far from any thought of objecting to them in the least degree, I disconnect them all, I make absolutely no use of their standards. I do not appropriate a single one of the propositions that enter into their systems, even though their evidential value is perfect, I take none of them, no one serves me for a foundation—so long, that is, as it is understood, in the way these sciences themselves understand it, as a truth concerning the realities of this world. I may accept it only after I have placed it in the bracket. That means: only in the modified consciousness of the judgment as it appears in disconnexion, and not as it figures within the science as its proposition, a proposition which claims to be valid and whose validity I recognize and make use of.[39]

Thus, from the above quoted text it appears that Husserl's critique of the abstracting tendencies of naturalistic science did not make him refute science. In fact, in the one but last sentence he actually reserves the right to use the products of science for his own purpose. According to Spiegelberg, however, Husserl's critique of modern science included two more strictures. First, Husserl blamed science, and positivistic science especially, for preoccupying itself with a study of mere facts which were absolutely irrelevant "for man's life as a whole," and "for his life purpose in particular."[40] Secondly, Husserl believed that the naturalistic attitude had "rendered science incapable of coping with the problems of ultimate truth and validity."[41] It appears that these two strictures were directed towards some epistemological underpinnings of science as a philosophy with a certain telos.[42]

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[38] Edmund Husserl, "The Thesis of the Natural Standpoint and its Suspension," in Joseph J. Kockelmans, *ibid.*, p. 76.

[39] *Ibid.*, p. 78.

In a summary article, Kockelmans compared two prominent epistemological views on phenomenology and its relationship to science. Stephan Strasser's thesis implies that phenomenology is incompatible with empirical psychology and that psychology should be founded in the existential phenomenological orientation.[43] Sartre, on the other hand, sees phenomenology as a special discipline which may or may not exert certain influences over empirical psychology. Phenomenology can have a special function in interpreting the results of empirical investigations. Sartre expressed the necessity for social scientists to respect the limits posed on their research studies by the methods they have chosen.

There is an essential epistemological difference between science and phenomenology, says Kockelmans, "one of the most striking points of which is that science never comes to radical 'thinking,' while in philosophy a radical and presuppositionless comprehending is precisely what is characteristic."[44] While phenomenology can be turned toward itself, science has a limited methodology in the sense that it is not able to ponder the essence of the objects about which it speaks.[45] This idea has been expressed at various times by Husserl and other writers. In his lecture "Science as a Vocation," Max Weber had pointed out that science is constitutionally unfit to settle questions of value and therefore questions of meaning and purpose for human existence.[46] Science is a practical activity in the sense that the problem the scientist is working at has exactly the same significance for the scientific activity as the practical interests have for activities in everyday work.[47] All science can be expected to do is to supply us with factual and technological knowledge which can be used for decisions about projects which are in essence extra-scientific.

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[40] Herbert Spiegelberg, *ibid.*, Vol. I, p. 79.

[41] *Ibid.*

[42] See the introductory chapter of this study.

[43] Stephan Strasser, *Phenomenology and the Human Sciences* (Pittsburgh, Pa.: Duquesne University Press), 1963.

The problem Kockelmans tried to solve, however, is whether it follows that the empirical social sciences require, on methodological grounds, a phenomenology of man. Theoretical science is characterized by an objectifying thematization of formalization, functionalization, and quantification. And because of the restrictions necessarily imposed by this reductive methodology,[48] science is ill-equipped to deal with "the concrete existential orientation toward the world and the immediately lived experiences as such." Is the physicalist model acceptable for a science of man? If so, should phenomenology enter a partnership with such social science? Or do social scientists need an entirely different methodology along the lines, for example, of the sociologists Max Weber or Alfred Schuetz? Although Kockelmans tries to answer such questions, he fails to provide a well-founded argument. One problem associated with Kockelman's inquiry is whether scientific methodology, in general, is not ultimately identical to the method of naturalistic or theoretical science. In the present study this question is implicitly if not explicitly answered in the affirmative. A genuine scientific theory of instruction will most likely have to be based on the naturalistic attitude. At various places in this study it was shown that this opinion is shared by ASCD (the Association for Supervision and Curriculum Development) and some of the most prominent educators.

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[44] Joseph J. Kockelmans, *ibid.*, p. 540.

[45] *Ibid.*, p. 541.

[46] Herbert Spiegelberg, *ibid.*, Vol. I, p. 79.

[47] Alfred Schuetz, *ibid.*

[48] See Chapter III.

It is interesting to note the tendency of non-scientific terminology creeping into so-called theories of teaching and learning.

The discovery model of teaching, the inquiry training model and those information processing models that are rooted in cognitive learning and developmental theory particularly, incorporate in their theoretic formulations propositions that demonstrate a definite concern for phenomenological terminology such as 'creativity,' 'relating to the whole person,' 'meaningful learning experiences,' 'insight,' 'instructional relevancy,' and 'intuitive grasping' to name only a few common phrases. So it seems that whatever orientation a student of instructional science implicitly or explicitly assumes, he would still need a descriptive phenomenology in order to reinterpret the results of his theoretical investigations in terms of the immediately lived world.

Sensory Observational or Experiential Data

Cybernetics and phenomenology employ different kinds of data. Cybernetics, as a theoretical science, makes use of sensory observational data. The phenomenologist accepts as the subject matter of his inquiry all aspects of a person's experience *(Erlebnisse)*.

The scientist obtains empirical evidence for his scientific knowledge from his systematic observations of sense data, i.e., from his attempts of perceiving patterns in the world and assuming structures that underlie those patterns.[49] In other words, the scientist processes and organizes the given sense data through acts of conceptualization, formalization, and (if possible) quantification. Within the realm of instructional science, teacher, learner and display are conceived as abstract entities, systems. And instructional products and events are viewed as measurable properties or functions of relations among those entities. In this manner, the scientist arrives at a body of facts and principles that make up instructional reality.

Discussing the nature of "facts" and "principles," John Dewey pointed out that a "fact" is a complex of sense data organized with respect to a prior frame of reference. And with this insight, the tale has gone full circle. "The fact is that all facts are at least in part intellectual constructs," i.e., the product of a person's epistemological orientation. Thus, a person's past experience determines what he sees, gives it meaning for him, and on the basis of this he makes his decisions and perceives new facts. An important implication, however, is that every particular epistemological orientation is selective in the sense that it includes certain aspects of reality and excludes others. For example, in *The Structure of Behavior*, Merleau-Ponty pointed out that even the indispensable methodological concept of "frequency" in science is still an observation of our mind: "in things there are only singular events which must be accounted for each time by particular causes."[50] This is not so much a concern of science *per se*. But it is important for the phenomenologist who has decided that in the social world science has neglected a sizable slice of human reality. Different orientations may result in radically different views of the world. In order to study the concrete reality of human living a phenomenological view is adopted.

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[49] See also Chapters III and IV.

Where the scientist of the naturalistic orientation tends to see the structure of the world as pre-given, objective and consisting of sense data, for the phenomenologist, the structure of the world is situated in the way one lives his experiences in that world. Analyzing this reality means, therefore, analyzing one's immediate experience of that reality. Thus, immediate experience does not refer to 'pure sensory observations' of 'raw sense data' but rather to 'interpreted perception,' in the sense of Merleau-Ponty. Phenomenon is the name for whatever appears in 'immediate experience,' and phenomenology represents the attempt to describe reflectively these phenomena of lived experience. For Merleau-Ponty, "phenomenon" means "the intimate relation between the objects and the subject and the presence of solid structures in both, which distinguish phenomena from mere appearances."[51] Consequently, phenomenology is viewed as the study of the "inventory of consciousness as a 'milieu' of the world." Judging from the variety of resources writers use in constructing phenomenological studies,[52] almost any means may be employed in describing this "milieu." Says Merleau-Ponty,

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[50] Maurice Merleau-Ponty, *ibid.*, p. 50.

> . . . if we make it our goal to reach the concrete, then in certain respects we must put art above science because it achieves an expression of the concrete man which science does not attempt.[53]

An important point is, however, that science itself is not excluded from the resources. (It is exactly for his use of scientific interpretations that Merleau-Ponty has been accused of betraying the phenomenological principle.)

Objects of Study

The next comparison between cybernetics and phenomenology is only a variation of the preceding one. It provides an opportunity, however, to discuss the notion of intentionality of consciousness.

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[51] *Ibid.*

[52] See authors such as D. J. van Lennep, R. M. Houwink, H. C. Rümke, B. J. Kouwer, J. Linschoten, J. J. Dijkhuis, J. M. van den Berg, E. E. A. Vermeer, and J. R. M. van Ratingen in J. H. van den Berg en J. Linschoten, *Persoon en Wereld* (Utrecht: Erven J. Bijleveld), 1963. And see F. J. J. Buytendijk, *De Psychologie van de Roman* (Utrecht: Het Spectrum), 1962.

[53] Maurice Merleau-Ponty, "The Primacy of Perception and Its Philosophical Consequences," *Readings in Existential Phenomenology*, eds. Nathaniel Lawrence and Daniel O'Connor (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1967, p. 50.

Objects of study for cybernetics are systems, variables, system behaviors (such as feedback and adaptation) and their causal antecedents (or alternatively its mutual causal interactions). Objects of study for phenomenology are consciousness of experiences and the structures of the life-world. The weakness of a methodology which reduces everything to physiological, physical or systemic processes is that it abstracts things eventually to extremes, until it has almost become a formal exercise. Learning may be seen as an experiential phenomenon and it is not possible to reconstitute the structure of 'learning experience' by combining, in the words of Merleau-Ponty, "ideal significations" such as stimuli, neural process of the brain, and systems adaptations and outputs. Instructional phenomenology regards the students and teachers, not as abstractions, but as meaningful human actors in complex psychological and social landscapes. Teaching-learning is participating in an experience. And like consciousness, learning is intentional in the sense that it always has an object (a concept, a feeling, a body of knowledge, a value or a skill) with which the person who learns is transacting. A corollary dictate is that the teacher must be trained to see the world with the eyes of his students. He must be able to feel with their feelings what life means to them. To that end, he must be able to analyze the existential structure of a learner's orientation, and the specific structures of the special orientations a learner has with respect to special subjects.

How is this possible? The phenomenological way of knowing is based in the natural mode. Even the behavioral psychologist who observes learning in his experimental animals must (implicitly) to some extent apply this mode. Other people (and even animals), says Husserl,

> . . . are immediately there for me; I look up, I see them, I hear them coming towards me, I grasp them by the hand; speaking with them, I understand immediately what they are sensing and thinking, the feelings that stir them, what they wish or will.[54]

Intentionality is the characteristic property of our consciousness, always directing this consciousness to that which it itself is not.[55] Or to use Brentano's familiar phrase, "all consciousness is consciousness of something." Consciousness is essentially oriented toward an object; it is this orientation, which is to be found in every act of consciousness, its intentionality. In other words, it belongs to the essence of our consciousness to form a meaning and consequently to constitute its own object. Phenomenology may then be defined as a study of consciousness. Lauer elaborates this notion as follows:

> [phenomenology] is an attempt to examine each act of consciousness as a "pure" act of consciousness, seeking to discover in each its essence. Now in 1900, while writing his *Logical Investigations*, Husserl submitted consciousness itself to a phenomenological investigation. He came to the conclusion that it is the very essence of consciousness to be "consciousness-of" something. Thirty years later, in the *Cartesian Meditations*, which was to be the last of Husserl's major works published during his lifetime, he expressed the same insight by saying that the essence of the Cartesian *cogito* contained the *cogitatum* as immediately as the *cogito* itself. In both expressions Husserl was saying that an act of consciousness and its object are inseparable or as he said in *Ideas I*, published in 1913, they are but the subjective and objective aspects of the same thing. Thus, to know an act of consciousness adequately, which is to say essentially, is to know its object.[56]

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[54] Edmund Husserl, *ibid.*, p. 69.

[55] Joseph J. Kockelmans, *ibid.*, p. 34.

[56] Quentin Lauer, *Phenomenology: Its Genesis and Prospect* (New York: Harper & Row, Publishers), 1958, 1965, p. 17.

A quote by Merleau-Ponty concludes this section: "We want to make consciousness equal with the whole of experience, to gather into consciousness for-itself *(pour soi)* all the life of consciousness in-itself *(en soi)*."[57]

The Language of Cybernetics and the Language of Phenomenology

Cybernetics employs a scientific language of genuine propositions.[58] And as a branch of general systems thinking, cybernetics formulates a special vocabulary for identifying isomorphs among various scientific theories that are concerned with communication, control, and engineering problems. To say it differently, systems theory presents the language of structure of structures; the structural properties that various disciplines have in common.

In Chapter III it was argued that the theoretical language of science constitutes a meta-language in the sense that it describes the second order world of science as compared with the natural world of ordinary or everyday discourse. Scientific theorizing abstracts the language in terms of which we describe events and phenomena of everyday reality. In this manner it produces a knowledge that transcends the momentary and the particular. One of the consequences of this scientific language is, according to a realist position, that it reveals the world "as it really is." The point has been made that it is an essential characteristic of science that it progressively de-anthropomorphizes, that is, progressively eliminates those traits which are due to specifically human experience.[59] The tendency of de-anthropomorphization is attributed in particular to the unique properties of the symbol systems of science.[60] Through a process of elimination science is becoming removed progressively further from what is specific of our human experience. What eventually remains is the highly abstract language of systems theory and mathematical relations.

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[57] Maurice Merleau-Ponty, *The Structure of Behavior* (London: Methuen & Co., Ltd.), 1942, 1965, p. 223.

[58] See Chapter III.

The upshot of the above position is that the application of systems theory to instructional science has the effect of demythifying, in the sense that it substitutes scientifically neutral concepts for anthropomorphically biased terminology. Some so-called scientific theories of instruction are thus unmasked as pseudo-theories, or better perhaps, as too much rooted in phenomenological terminology of what is considered specific of our human experience.

Now, the phenomenological use of language as a symbol system is in radical contrast to the one discussed above. Cybernetic theory speaks of phenomena, and to that extent is a scientific language. But the phenomena of which it speaks are already themselves phenomena that are contained in language. And the point is, that these phenomena do not have to exist in experience in the way that they are contained in the language. The task of phenomenology is to trace back exactly to direct experience any verbalized experience it desires to examine. The understanding of a symbol, says Karl Jaspers,[61] does not consist of grasping its significance in a rational or scientific way. But rather, it consists of experiencing it existentially in the symbolic intention as the unique reference to something transcendent "that vanishes at the limiting point." Even scientific statements presuppose a much more fundamental experience than scientific experience. Its language would become otherwise unintelligible.

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[59] Ludwig von Bertalanffy, *General Systems Theory* (New York: George Braziller), 1968, p. 242.

[60] *Ibid.*, p. 244.

[61] Karl Jaspers, *Philosophie* (Berlin, 1932), Vol. 3, *Metaphysik*, chapter one, p. 16.

The phenomenology of language poses problems for the relationship between language and experienced reality. To some extent language appears to bias interpretations of our experiences, and at the same time, our experiences influence the formation of symbols in language. Thus, my 'expressed' (in some symbol system) experiences are not always representative of my true experiences. Language provides us with an already existent symbol system so that, when we express something in words, we do not necessarily falsify experience, but we express what has been experienced in its "experienced expressibility."[62] That is, language already plays a role in the modes of experience.

Language that describes the reality of lived experience is needed side by side with the language of the objective reality of science. One cannot describe learning and teaching solely in terms of the behavioral language of systems. It would be impossible to do justice to the total intentional presence of the teacher and learner to human reality, by means of such terms alone.

Principles of Parsimony versus Principles of Dialectics

Science is ruled by the principle of parsimony (often referred to as Occam's razor) which decrees that complex explanations or methods should progressively be replaced by simpler and more precise formulations wherever possible. Phenomenological method is based on the principle of dialectics. Stephan Strasser defines dialectics as any orderly change of standpoint which allows man in his striving for meaning to neutralize systematically one-sided perspectives and limited horizons. $E=MC^2$ represents the pinnacle of scientific thought. With the least number of elements science tries to be relevant, i.e., to apply itself to a maximum portion of reality. Phenomenology is not concerned with parsimony in the sense that it attempts to describe aspects of the life-world in a manner which does justice to the fullness of the phenomena. In this respect, says Spiegelberg,[63] phenomenology stands for a kind of rebellion against the tendency of modern science to begin with simplifying abstractions and to end with a minimum vocabulary of scientific concepts and differential equations.

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[62] Hans Linschoten, *On the Way Toward a Phenomenological Psychology* Pittsburgh, Pa.: Duquesne University Press), 1968, p. 125.

Methodology: Theoretic Abstraction versus Phenomenological Description

Phenomenology and science have different methods. The method of science is applicable to any kind of behavior or objectively demonstrable (i.e., publicly verifiable) attributes or consequences of events. And the basic problem of science is the determination of causation[64] or nomothetic relationships among systems and elements of systems. For this purpose science employs the methodology of objective observation, data collecting, empirical analysis, measurement, hypothesis testing and the derivation of theorems from theoretical systems. The strength of the methodology of natural science rests upon analysis and reduction. Although different scientists may use different techniques, the scientific method, in general, is accepted widely.

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[63] Herbert Spiegelberg, *ibid.*, Vol. II, pp. 6-8.

[64] See Chapter III.

Even though Merleau-Ponty defined phenomenology as to be accessible only through a phenomenological method, the essentials of phenomenological method are not as uncontested as those of theoretical science. Eminent proponents of the movement such as Heidegger, Merleau-Ponty, Sartre, and Buytendijk have accommodated and modified Husserl's early directives according to their own needs.

In comparing cybernetics with phenomenology it does not suffice simply to call cybernetics (as a branch of science) "objective" and phenomenology "subjective" in terms of its methodological approach. Phenomenology is not a subjective methodology in a solipsistic or introspective sense. It is subjective only in the sense that its purpose of inquiry is to investigate the way actors (i.e., teachers and/or learners) experience their actions in the instructional world.[65]

In his book *Phenomenology and the Human Sciences*, Stephan Strasser[66] distinguishes three features which characterize the phenomenological approach in studying man in his life-world. Phenomenology, he says, is hermeneutic, intuitive and dialectic. Hermeneutics asks the question: "What do I bring to the situation?" In contrast to Descartes' ideal of removing all presuppositions, hermeneutics acknowledges the fact that a person's thinking is always already 'situated'. My existence is always presupposed.[67] All my knowledge of the world, says Merleau-Ponty, even my scientific knowledge is gained from my own particular perspective which resides in some experience of the world without which the symbol systems of science would be meaningless. My system of knowledge and relevancies is built upon the world as directly experienced by me. Thus, something is always presupposed in the phenomenological attitude, namely, my existence.

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[65] For an excellent article on the problem of subjectivity in phenomenological method see H. Spiegelberg, "How Subjective is Phenomenology?"(*Proceedings of the American Catholic Philosophical Association*) XXXIII, 1958, p. 287.

[66] Stephan Strasser, *ibid*.

The phenomenological approach also is intuitive. Intuition asks the question, "How do things appear to me?" (i.e., as immediately given experiences). Strasser downgrades the importance of intuition for concrete pursuits in phenomenology. Intuition poses the problem that arises in the opposition between 'appearance' and 'reality.' For example, Columbus went to look for the Indies. When he finally saw land he did not doubt that this land was the Indies. In this sense appearance 'is.' An individual anticipates of necessity what he will perceive, experience or discover. By anticipation, he assigns to that which he expects a place within the framework of his conceptual system which constitutes his 'horizon.' For example, an adult sees a table as "a thing to put something on," a child sees a table as "a possible place to play hide and seek." In Strasser's words, "to see" and "to see as" constitute one and the same concrete intuitive act.[68]

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[67] *Ibid.*, p. 250.

[68] *Ibid.*, p. 255.

Dialectics is the third feature that is characteristic of phenomenology. Strasser views dialectics as the indispenable complement of the principle of intuition. The typical "covered-up-ness" that is associated with some intuitive perceptions has an obvious precarious evidential status. The method that is used to 'unveil' systematically that which is at first 'covered up' (such as in the form of 'appearances') is the dialectical method, involving the 'orderly change of standpoints' discussed in the above paragraphs.

The most comprehensive account of phenomenological method probably has been offered by Spiegelberg in the last chapter of his historical introduction to the phenomenological movement.[69] It appears that he has done such a commendable job that, as an independent publication, this chapter has become widely used by professors offering course work in phenomenology.

Spiegelberg constructed a scale of seven "steps of the phenomenological method" arranged in descending order of essentiality. The first three steps are implicitly practiced by virtually all phenomenologists, the latter steps only by a smaller group.[70] The seven steps of the phenomenological method are:

1) investigating particular phenomena (including the following three operations: phenomenological intuiting, analyzing, and describing);
2) investigating general essences (eidetic intuiting);
3) apprehending essential relationships among essences;
4) watching modes of appearance;

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[69] Herbert Spiegelberg, *ibid.*, Vol. II.

[70] *Ibid.*, p. 659.

5) watching the constitution of phenomena in consciousness;

6) suspending belief in the existence of the phenomena, and

7) interpreting the meaning of phenomena.[71]

More detailed examination of the above steps is presented in the next chapter on the epistemology of cybernetic phenomenology.

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[71] *Ibid.*

Chapter VI

CYBERNETIC PHENOMENOLOGY OF INSTRUCTION

Epistemological Comments

What is the aim of cybernetic phenomenology? In general, it seeks to understand the teacher and learner from the total instructional situation, i.e., from the meaningful structure of the totality of situations, events, and contexts of the instructional life-world, toward which these individuals have an orientation. Cybernetic phenomenology has as its goal the understanding of the world in which a particular student or teacher exists, in which he finds himself, and which he shapes through his own orientation. A teacher or learner is not merely some 'thing' with thing-like 'states' and 'structures,' but rather he is an 'initiator of relations' toward the 'other' and toward the meaningful environment which the teacher and learner share.

Cybernetic phenomenology is conceptualized as an orientation toward the study of instructional reality which combines extreme objectivism with extreme subjectivism. A theoretical science of instruction may view teaching-learning phenomena and events in terms of properties of cybernetic systems and subsystems. However, the scientific approach can abstract only measurable behaviors and quantifiable information exchanges. While recognizing the essential appropriateness of the cybernetic approach and its key concepts of uncertainty, homeostasis, and adaptation to the analysis of instruction, it is recognized also that the scientific route is not fit to to do justice to the fact that on the existential level teachers and learners do not just behave, they act. Behaviors are 'caused' but actions are 'orientated toward,' that is, actions are purposeful in an (anthropomorphic) teleological sense.

Cybernetic phenomenology may be conceived as a special mode of inquiry into the phenomena of instruction. Cybernetics demarcates the area of thematic concerns of this orientation; phenomenology refers to its methodology. Thus, cybernetic structure and concepts can be retained to provide the thematic framework within which terms such as adaptation, novelty, content-context reversal, purposiveness, relevancy, and related ideas can be taken up as themes for phenomenological analysis. The number of phenomena to be investigated are virtually endless. They may be sought 1) in the particular ways a teacher or learner 'adapts' to the instructional environment, the teacher by teaching and the learner by learning; 2) in the nature of the 'transactional situation' between learner and display, or conversely, between teacher and display; 3) in the modes of 'communication' and the kinds of 'messages' and 'channels' used; 4) in the nature of the 'displays' and the way these are experienced; 5) in the kind of relation that exists between the teacher and learner, including the forms of control or influence operating in this realm; 6) in the particular characteristics of a typifying student or teacher; 7) in the specific phenomenon of teaching a certain item of knowledge; 8) in the phenomenon of learning some 'thing' new; 9) in the nature of particular orientations, and so on.

Cybernetic phenomenology represents the attempt to investigate and to describe the phenomena of the life-world of instruction as faithfully as possible. In this sense it makes a claim to be considered as a valuable orientation and potential research methodology. Cybernetic phenomenology comes to the instructional situation with 'foreshadowed questions,' but so does every investigator. The point is, that the orientation under discussion recognizes its phenomena to be found in the broad field of cybernetic thinking. Within the scientific orientation, instructional cybernetics can only be operationalized in a rather trivial way. Therefore, the concepts of cybernetics must be reinterpreted on the empiricist level in a 'radical' way. In this process theoretical concerns become thematic concerns. Cybernetic phenomenology is not equipped to produce explanations of theoretical or nomothetical relevance; instead, it attempts to describe thematic problems (of cybernetics) of existential relevancy. This 'shift' from nomothetic relevancy to existential relevancy accompanies the 'shift' from the scientific orientation to the phenomenological orientation.

To the extent that cybernetic principles, concepts and facts are being used, this should not be interpreted as an attempt to build nomothetic theory into the design. Cybernetic phenomenology does not attempt to build an empirical system of theoretic propositions. Propositions are introduced for what they are worth 'by themselves,' not to lend credence to the explanatory or predictive force of a phenomenological study. Explanation, prediction and control, insofar as one wishes to speak of these operations, acquire new meanings and understanding in the shift from the theoretical to the existential. The thematic function of cybernetics only functions as a selection criterion. That is, once I have decided to 'select' a phenomenon from the cybernetic world of instruction, I subsequently proceed by suspending any further commitment to the cybernetic perspective. In a way, cybernetics serves as a conceptual language with which the educator comes to the scene of a structural situation which he calls instruction. Any particular orientation toward an aspect of reality yields concepts which may be subjected to phenomenological analysis. From the preceding chapter, it has become clear that cybernetics as a system and phenomenology as a system are wholly incompatible; not so much because of the nature of the cybernetic orientation, but rather, because the phenomenological method consists exactly in "suspending" every other systemic orientation including that of cybernetics. The point is, that no phenomenologist can 'select' his thematic topic 'interest free.' For example, Alfred Schuetz comes to select the phenomena he wishes to examine from a sociological perspective. Alfred Schuetz was first a sociologist, who applied the phenomenological method to topics that interested him as a sociologist of a specific orientation. Similarly, Buytendijk initially came to use the phenomenological method as a biologist, with a special interest in animal psychology. And thus, it seems that the attempt is not illegitimate to adumbrate one's interest in the phenomenological method from an educationist stance of a certain orientation, namely, an orientation toward the reality of instruction, which understands the instructional situation—not in the way of babysitting, bookkeeping, nursing, conducting discussions or lectures, refereeing, proctoring tests, or the many other activities associated with the school—rather, instruction as viewed initially from the perspective of cybernetics, That is, the referents of instruction are indicated by those communicative relations between teacher and learner where the learning process is viewed as a process of transactions and adaptations; the specific structural properties of the communicating teacher and learner are defined as orientations, and so on. More specifically, instruction may be viewed as a structural relation between teacher and learner where the 'orientations' of these two actors are in constant communication. Such a relation is found in Carlos Castaneda's account of his apprenticeship under the guidance of his teacher don Juan. It really does not matter how such an instructional relationship is called and for this reason, the next chapter is entitled "The Sorcerer's Apprentice," to indicate a relation, which may well be characteristic of any good instructional situation. Again, I suspect that a phenomenological analysis of such a relation is legitimate. A phenomenon always is chosen because it is of some interest to the investigator.

Three Research Methodologies

How does cybernetic phenomenology as a methodology relate to other research methodologies in the area of instructional theory and social education? From a brief excursion into the dominant research methodologies it appears that cybernetic phenomenology has selected a unique epistemological course.

Three dominant modes of observation are associated with three orientations in doing research into the area of social education. First, there is the statistical researcher who comes with (usually computerized) paper and pencil tests for the statistical interpretation of the effectiveness of certain treatment variables, interaction effects, etc. This researcher is testing (ideally) the empirical validity of theorems derived from new or existing teaching-learning theories. Even if he collects the data himself, then he usually does not see the groups of subjects more than twice. Outcomes of this type of research usually are statistical interpretations derived from group data, not individuals. Longitudinal studies are comparatively rare.

Secondly, there is the interaction-analyst. This person more or less unobtrusively records interaction patterns in the classroom among teachers and learners. In social studies instruction, the techniques chosen for interaction analysis are preferably the systematic observation of discussion sessions. Using observational categories, the content of ongoing discussions is coded and entered on tabulation forms. Different category systems measure different things. Ober, Bentley, and Miller[1] discuss sixteen of those observational systems.

The statistical researcher tends to take a close look at a very limited sample of behavior—and only that behavior which can be precisely measured, controlled, manipulated and analyzed.[2] The interaction analyst may investigate a larger slice of reality, but he too abstracts teaching-learning phenomena in terms of behavioral codes. The first attempt to immerse oneself in the reality of the classroom without the obstacle of some superimposed category schema is represented by a relatively new classroom methodology, namely, ethnography.

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[1] Richard L. Ober, Ernest L. Bentley, and Edith Miller, *Systematic Observation of Teaching* (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1971.

[2] James P. Shaver and A. Guy Larkins, "Research on Teaching Social Studies," *Second Handbook of Research on Teaching*, ed. Robert M. W. Travers (Chicago: Rand McNally & Co.), 1973, p. 1256.

Thus, the third and most recent approach in studying classroom teaching-learning is the method of "micro-ethnography," as it is called by Louis M. Smith[3] who initiated the project. For periods of time lasting as long as an entire semester, Smith enters the classroom with pen and writing pad, intent on reporting as much as he can catch of that information that reflects the multiple strands and streams of events and happenings of the real live classroom. Both verbal and nonverbal behaviors are recorded and analyzed for the contribution they make to the dynamics of the classroom. There are no fixed hypotheses to be tested, nor is the information that is gathered pre-screened already by the structural codes of some category schema. The approach of the ethnographer is holistic and open-ended; no *a priori* research problem is delineated. This does not mean that Smith goes completely unprepared into the classroom. Certain interests and questions are identified prior to a field-study. Smith calls these foreshadowed problems,[4] which do not determine completely, but rather selectively guide the researcher's perception, and which provide a focus for observation.

Classroom micro-ethnography is new to research on social studies[5] but its aim is similar to the traditional research methodology, namely, the generation of true propositions and the development of teaching theory, or as Smith calls it, "miniature" or "middle range" theory.[6] In contrast with the more abstract theories, middle range theories are more practically applicable to the real classroom situation, so says L. M. Smith. However, for reasons that will not be discussed at this point,[7] one must doubt the epistemological status of so-called "middle range" theories. Whatever the case, classroom ethnography, as developed by Louis Smith, is viewed as an alternative methodology for theory construction and the generation of theoretic propositions. And so, cybernetic phenomenology is not to be identified with this approach.

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[3] Louis M. Smith, *The Complexities of an Urban Classroom, An Analysis toward a General Theory of Teaching* (New York: Holt, Rinehart and Winston, Inc.), 1968.

[4] Malinowski made a distinction between "preconceived ideas" and "foreshadowed problems."

[5] James P. Shaver and A. Guy Larkins, *ibid.*, 1258.

Emics and Etics

At this point, it may come to mind that cultural anthropology offers two research options within the movement of the New Ethnography. And one of these, the emic approach, may seem to have a bearing on the present discussion.

It was the linguist Kenneth Pike who made a distinction between two types of techniques in the observation of individual actors: the emic and the etic approach.[8] Emically oriented studies primarily have been carried out in the area of phonological, grammatical and semantic analyses by linguists and ethnographers. However, a distinction between emic and etic methodologies also has wider ramifications. In outlining the operations for the identification of nonverbal emic units (behavioremes), Kenneth Pike points out that emic structures must correspond to the actor's 'purpose' during an observed performance. Emic study helps one to appreciate the particular life-world of the individual actor: his attitudes, motives, interests, responses, conflicts, and personality development.[9] That is, an emic description must be based on a methodological procedure by which the actor's meaning and purpose is made known.

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[6] Louis M. Smith, *ibid.*, p. 18.

[7] Reasons that are implicit in the discussion of Chapter III.

[8] Kenneth Pike coined the terms 'emic' and 'etic' after the 'emic' in phonemic and the 'etic' in phonetic. Kenneth Pike, *Language in Relation to a Unified Theory of the Structure of Human Behavior*, Vol. 1 (Glendale: Summer Institute of Linguistics), 1954.

The contrast between emic and etic studies is quite reminiscent of the distinction made earlier in this study between research orientations that look at their objects of study 'from the outside' as compared to those that take the view 'from the inside.' The emic/etic distinction in the social sciences corresponds roughly to the introspective, subjective, or cognitive approaches as opposed to the neo-behavioristic learning theory schools.

Thus, while etic descriptions are wholly behavioral, and usually recorded in accordance with the codes of some superimposed category system, emic distinctions require the observer to enter the world of purpose, meaning and feelings of the observed individual. An etic approach, out of epistemological necessity, avoids the philosophical premises of the emic approach. Consequently, the emic universe of 'meaning,' 'purposes,' 'goals,' 'motivations,' 'feelings,' etc., is unapproachable from an etic orientation. For example, an emic statement may be falsified if it can be shown that it contradicts the judgment of the concerned actors with respect to the appropriateness of the interpretation of the observation.[10] This means that the nature of the actor's own orientation, his particular point of view, is an important consideration. Etic statements, on the other hand, cannot be falsified if they do not conform to the actor's notion of what is significant, real, meaningful or appropriate. In this case, it is the scientist who has constructed the etic behavior categories. The distinction between etics and emics is instructive in the sense that it has been demonstrated that attempts to transmute emics into etics find no epistemological justification and are bound to fail.[11]

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[9] Marvin Harris, *The Rise of Anthropological Theory* (New York: Thomas Y. Crowell Co.), 1968, 1969, p. 571.

Reflection: Experiencing one's Experience; from Cybernetics to Phenomenology

Before continuing with the discussion on the methodological techniques of cybernetic phenomenology, it may be worthwhile to engage in a short excursion into the notions of 'reflection' and 'experience' since these terms are central for the later portions of this chapter. Briefly, an attempt shall be made to view 'reflectivity of experience' as a homeostatic mechanism, after which the phenomena of experience and self-consciousness will be put in the context of William James' and Husserl's systems.

Homeostasis as reflective experience. In Chapter IV it was argued that it is reasonable to think of higher organisms in terms of a hierarchical arrangement of homeostatic levels in which every higher level presupposes the lower. Systems on a higher level of homeostasis possess properties not characteristic of simpler systems. Adaptations are functions of outer happenings and inner dispositions, and they are unpredictable to the extent that the organism has formed an internal organization which allows for the attainment of a relative autonomy. Every higher homeostatic level signifies an increased plasticity, a broadening of the possibilities of adaptation to exceedingly variable environments.

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[10] *Ibid.*, p. 571.

[11] *Ibid.*, pp. 577-578.

A special form of species specific adaptation is the phenomenon of consciousness or reflective experience from which the individual benefits through learning. Learning is an individual adaptation of a particular organism to particular situations that leads to an increased facility of dealing with the contingencies of those situations. When something new is learned, then this takes place on a new homeostatic level. Acquired cognitions are not pregiven in the way that instincts are innately pregiven. It was shown that learning results always from *individual* adjustments. This individual acquires a new autonomy; functional-structural adaptation to the environment becomes, to some extent, a dominion over the environment. Thus, reflection, considered functionally, is a new homeostatic mechanism: it makes experience accessible and usable as experience. Human reflection is on a different homeostatic level than that of other animal species. In fact, the functional-structural adaptation of each species occurs in a different context and on a different level. Consciousness is at the disposal of the organism so that it may adjust itself in different ways; i.e., with a certain degree of autonomy of choice. Adaptation involving consciousness is not passive but active. The organism is characterized by a relative autonomy which finds, in homeostasis, both its foundation and its expression. The grasping of relationships among things and events and the awareness that ensues from it, enables the human learner to adapt himself in new ways to the environment—while maintaining his own norms. Thus, reflection enables us to confirm the relative autonomy and to foster it by actively engaging ourselves in the environment.[12]

Experiencing one's experience.

I am breathing
seeing
hearing
smelling
feeling
warm
excited
relaxed all at the same time

and really my *experience*
is none of these
which are only words, symbols,
which try to convey
my existence which is
every moment — alive —
change — moving —
NOW

— Bernard Gunther

In the phenomenological notion of 'experience' or 'becoming' one can find the epigenetic notion of "adaptation," the common cybernetic variable in structural theories of development as different as those of Piaget and Maslow. The structure of experience was conceived

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[12] Hans Linschoten, *On the Way Toward a Phenomenological Psychology* (Pittsburgh, Pa.: Duquesne University Press), 1968, p. 301.

(independently) by both Husserl and James as having a flowing character, marked by retention and protention (anticipation), i.e., as a going back to what went before and an anticipation of coming experiences. And it is in this fundamental structure of experience that both men see the foundation of self-consciousness and reflection. According to Husserl, every experience is in itself a flux of the 'becoming': a constant flow of retentions and protentions mediated through one self-flowing phase of originality in which the living Now of experiences becomes conscious of its 'before' and 'after.'[13] Husserl defined retention as a special kind of intentionality. When we have a new experience, the previous one is not lost but is 'kept in our grasp.' Thus, retention is a latent reflection that can be achieved by applying it to the past which remains within our grasp. The achievement of retention is defined by James as "appropriation." Appropriation, then, is the constant adding to the corporeal self in the experience of previous experiences. In this continuous appropriation is situated the 'I,' the feeling of personal identity. Retention is itself not yet a backward look. And when retention is achieved in a reflection then this backward grasping is itself an actual experience, and essentially a non-reflective experience. Reflective experience is a conscious reflecting on the retention in reflection. Reflection is the fulfillment of the possibility pre-given in the retention, so that experience, grasping backward, experiences 'itself.' And in this reflection is achieved the consciousness of one's personal identity.

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[13] Edmund Husserl, in Hans Linschoten, *ibid.*, p. 291.

The other component of the structure of 'actual experience' is the notion of protention. Protention, just like retention, comes about before all reflection. The possibility of appropriating protention reflectively is called 'anticipation.' Protention is situated in our 'corporeal knowing' that we can think, say, or do something before we are aware of it reflectively. Protention is achieved when we already have performed reflectively something that we are simultaneously about to do. For example, before I reach out to fetch my dictionary, I know that I can reach it; and before I do a broad jump, I am, as it were, already on the other side of the ditch.

According to William James,[14] there first must be a 'knowing' of one's ability (of the 'I can'), a store of images of movements that are based on experience, which make protentional experiences possible. We experience protention as a feeling of doxic confidence or trust in the wisdom of our body, that is, of our total 'self.' Neither retention nor protention is reflective in itself. But one can become aware of it by making the experience of it accessible in a reflection of this experience. Thus, by reflecting on my retentions and protentions I can say: I experience my experience. Human experience has an irreducible view of things, and so human behavior can be understood and described on the basis of experience itself.

Cybernetic Phenomenological Methodology

What then is the methodology of cybernetic phenomenology?

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[14] William James, *The Principles of Psychology*, Vol. 2 (New York: Dover Publications, Inc.), 1890; 1950.

Cybernetic phenomenology is an 'experience based' or an 'experience oriented methodology.' Specifically it refers to experiential phenomena of the world of teaching-learning. The methodology of cybernetic phenomenology employs various techniques depending upon the nature of the phenomenon. Consider, for example, the notion of orientation.[15] How would one describe the phenomenon of orientation which has relevance for the teacher-learner relation? The first important reminder is, that the search is not for 'explanations,' but for a descriptive investigation into the phenomenon of orientation as an aspect of a student's life-world. Since this could be a typical problem posed by cybernetic phenomenology it may be useful to outline what methodological steps are needed for such an investigation.

Dialectics. First there is the dialectical principle which urges the investigator to make use of a variety of points of view. Consider the following stances:

(1) How does the learner become aware of his experience of the phenomenon of 'orientation' and the modifications that take place in such orientation when teaching-learning takes place?

In his study the researcher will include anecdotes, descriptions how the phenomenon of orientation figures as experienced directly by the learner himself. For this purpose, the researcher tries to collect relevant materials from learners: he talks to them, interviews, collects material from student writings such as autobiographies, poetry, stories, essays, excerpts of diaries, and so on. In fact, the researcher, himself a student, may use his own learning experience reflectively.

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[15] The notion of orientation is derived from the preceding chapter.

(2) How does the phenomenon of 'orientation' appear from the point of view of the teacher, whose task it is to bring about changes in a learner's orientation?

The study of orientation must include the teacher's view. How do I as a teacher perceive the student as orientated towards a display item and how am I aware of the relation of my own orientation *vis-à-vis* the student's? That is, how do I as teacher experience my orientation as it is constrained by my educational objectives? How do these objectives acquire meaning within my orientation and what is the nature of the dynamics of teacher-learner orientations interacting and transacting (i.e., undergoing adaptations) via the display?

(3) How does a participant observer describe the phenomenon of orientation?

A different stance is occupied by the outside observer, who looks at the instructional process as a communication system. How do the actors' orientations appear in the communicative process? The transmission of information cannot be pure: it always is embodied in transmission. That is, there is an interpenetration of communication and transmission. Students have to answer in a 'personal way' to teachers and vice versa. The observer could, for example, use an ethnomethodological approach[16] in clarifying the coding-decoding processes in the communicative process. What is said (literally)? and what is being said (really)? A painstaking transcribing of the meanings of messages in terms of a teacher's or learner's purposes, feelings, beliefs, etc., could reveal how orientations function in the instructional situation. Similarly, in the learning process where the student selectively transacts with a display, specific studies could be made regarding the way an identical social science text, for example, 'figures' in different learner orientations. How are the 'experiences' of one student different from another? And what are the implications of this for the teaching-learning process?

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[16] See Harold Garfinkel, *Studies in Ethnomethodology* (Englewood Cliffs, N.J.: Prentice-Hall, Inc.), 1967.

(4) How does the concept of 'orientation' appear when investigated reflectively, from external points-of-view?

The external point of view is represented by phenomenological analysis of orientation by the researcher himself, supplemented by materials he can obtain from a variety of sources: social science texts, novels, reports, poetry, art in general, philosophical studies, scientific data, and so on.

The phenomenological investigator first systematically examines how specific systems of knowledge are built up around the phenomena he wishes to investigate. The point is, however, that he is not satisfied merely with acquiring some particular system of knowledge. The phenomenologist wishes to understand this knowledge 'for what it is.' There is a difference between mere 'knowing' and 'knowing one's knowing.' The phenomenologist attempts to reach the latter level of reflexivity.

Merleau-Ponty described his *cogito* as "my being-present-within-the-world" *(être-au-monde)*. Thus, when I say that I know something, then this refers to the relation between the 'I' and the 'object' which are present to each other in some way. According to Merleau-Ponty, the world is nothing but the field of our experience, and we are nothing but a certain perspective of it.[17] In other words, the *for itself* and the *in itself*, the inside and the outside, the subjective and the objective are inseparable. Within myself, I have to learn to recognize the junction of the *for itself* and the *in itself*.[18] At the same time, says Merleau-Ponty, although I am always tied to some perspective, constituted by my way of being-present-in-the-world, I am not tied to any one perspective but can change my point of view.

When we act or speak, usually we do so spontaneously. The body does it for us, as it were. As a result, I can hear myself speak if I wish, and *I* can reflect on *me* speaking or acting. Thus, the distinction of the body as *object* and the body as *subject* comes in. 'I' can have knowledge of something and 'I' can have knowledge of 'me' having knowledge of something. In a similar context, George Herbert Mead discusses the "self" in terms of the "I" and the "Me."[19] A classical theme in philosophy and philosophical anthropology has been to inquire into the nature of the 'eye' of the 'I' observing 'me.' The question is, who is this 'I' that sees 'me'? Merleau-Ponty treats this theme in his chapter on "the *cogito*."[20]

I cannot really understand something unless 'I' know 'me' as the possessor of that knowledge. Consciousness is viewed as the oscillation of the self as the subject of experience (e.g., I know that . . .) and the self as the object of experience (e.g., I know myself knowing that . . .). This is what objectivity means in a phenomenological context. The phenomenological method, therefore, cannot be applied unless the researcher knows how to perform the function of 1) coming to grasp with his own knowing, and 2) changing his orientations, i.e., his modes of being-present-within-the-world.

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[17] Maurice Merleau-Ponty, *Phenomenology of Perception* (London: Routledge & Kegan Paul), 1946, 1970, pp. 405-407.

[18] *Ibid.*, p. 373.

[19] George Herbert Mead, *On Social Psychology* (Chicago: The University of Chicago Press), 1934, 1969, pp. 228-233.

[20] Maurice Merleau-Ponty, *ibid.*, pp. 369-410.

Thus, the approach of the researcher is dialectical. He 'builds up' his description of, for example, the phenomenon of 'orientation' in much the same way as an artist proceeds. There is no rule of logical necessity which dictates that two 'correct' descriptions of the same phenomena must be identical to one another. The rule for judging the adequacy of a cybernetic phenomenological project is 'authenticity' rather than 'truth.' Dialectics does not refer to the Hegelian practice of resolution of contradictions and opposites in a narrow sense, i.e., by a systematic treatment of the thesis, antithesis, synthesis paradigm. Rather, the idea of dialectics is conceived of as a general validation procedure. By investigating phenomena from shifting stances, impurities in the descriptions will become manifest and may be cancelled out. Furthermore, the dialectical principle results in the emergence of an holistic description, wherein the various stances are functioning to provide the sort of "multidimensional grasping" that Maruyama[21] referred to with the notion of "polyocular thinking." By looking at things from different stances, one stands to gain not only a quantitatively more complete *vue*, but also a qualitatively enriched multidimensionality.

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[21] Magoroh Maruyama, "Paradigmatology and its Application to Cross-Disciplinary, Cross-Professional and Cross-Cultural Communication," Unpublished paper, 1973.

Spiegelberg's Steps of the Phenomenological Method

At this point it may be opportune to introduce in more detail the methodological procedures of cybernetic phenomenology. Special use shall be made of Spiegelberg's excellent treatment of the phenomenological method. However, considerations of space necessitate a condensation of the substance of Spiegelberg's exposé. Since only the seemingly essential points are presented, the text may become somewhat succinct or terse.

1) *Investigating particular phenomena.* Spiegelberg distinguishes three operations which usually are referred to as 'phenomenological description': intuitive grasping, analytic examination, and description of phenomena.

Intuiting *(Schauung)* refers to the attempt of grasping the uniqueness of specific phenomena, and grasping the sensitivity of the finer shades of phenomena.

Phenomenological analyzing is not to be confused with the analytical techniques of philosophy of language and analytical philosophy which are interested primarily in the linguistic aspects and usages of terms. Instead, it attempts to trace the elements and structure of the phenomena obtained by intuiting.[22] Phenomenological analysis stands for "the general examination of the structure of the phenomena according to their ingredients and their configuration."[23] The underlying question is consistently "what goes on in our experience" *(Erlebnis)*. Husserl's expression "intentional analysis" *(intentionale Analyse)* reflects and emphasizes the fact that intentionality is the basic structure of phenomena.

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[22] Herbert Spiegelberg, *The Phenomenological Movement*, Vol. II (The Hague: Martinus Nijhoff), 1965, p. 669.

Phenomenological description primarily is 'predication,' which aims at bringing out the underlying pre-predicative experience. That is why Spiegelberg says that "phenomenology begins in silence." Some features of the technique of phenomenological description involve the use of connotations, classifications, metaphors, and description by negation. The objective is to elicit in the listener or reader his own actual or potential experience of the phenomena. In this attempt no specific phenomenological description can exhaust all the properties of any particular phenomenon. Phenomenological description is, therefore, a selective exercise.

2) *Investigating general essences*. This technique has been referred to in various ways, originally as "eidetic or essential intuiting" *(Wesenschau)*, as "experience of essences" *(Wesenserfahrung)*, "insight into essences" *(Wesenseinsicht)*, and "cognition of essences" *(Wesenserkenntnis)*. Intuiting of essences is preceded or accompanied by the intuiting of exemplifying particulars. Indeed, Buytendijk called phenomenology the "science of examples." Briefly, what it involves seems very much like concept formation. In order to apprehend the general essence of a phenomenon, we have to look at the particulars

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[23] *Ibid.*, p. 671.

as examples, i.e., as instances which stand for the general essence.[24] By "looking through" particular examples, one arrives at general essences or universals. In this process general essences are conceived of as phenomena *sui generis.*[25]

3) *Apprehending essential relationships.* A phenomenological study of essences includes the discovery of certain essential relationships or connections *(Wesenszusammenhänge)* which pertain to such essences.[26] Through a process of "free imaginative variation" internal relations (i.e., within one essence) or external relations (i.e., between several essences) are examined in terms of their absolute or relative intrinsicality. By keeping one component or essence constant and deleting or replacing other components or essences, one finds which connections are merely 'possible,' which are 'relative' and which are 'absolutely essential.'

4) *Watching modes of appearing.* What is involved in this technique is an examination of how an object presents itself to us. Appearance refers more specifically to the way in which a phenomenon is directly or indirectly accessible to the reflective eye of the observer. Phenomenalism would hold, for example, that we can see only one side of an object at once. In this view, any object is reduced to a series of lateral phenomena—in the way something appears in visual perspective. However, phenomenological research shows that this is not so. "In them and through them" says Spiegelberg, "the cube appears

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[24] *Ibid.*, p. 677.

[25] *Ibid.*

[26] *Ibid.*, p. 680.

as an encompassing structure, in which they have their definite places."[27] In other words, we experience things not in their phenomenal appearances but in their phenomenological appearance. 'How' things appear is of methodological interest.

5) *Exploring the constitution of phenomena in consciousness.* Constitutional exploration refers to the process of determining in which way a phenomenon establishes itself in consciousness. The constitutive process can be viewed as the manner in which ideas, persons, things, or places take shape in our minds. In meeting a person, for example, we attend to our first impressions of this person, such as his movements, gestures, voice, etc. This constitution normally is spontaneous and passive, although a more active and deliberate constitution may occur when, for example, we spend considerable effort in reorientating ourselves after disorientation.

6) *Suspending belief in existence.* According to Spiegelberg, the device of suspending, bracketing, or the *epoché* (also referred to as phenomenological reduction) never has played such a central role in phenomenological method as Husserl had suggested. One of the reasons for this may be sought in the fact that Husserl did not manage to formulate the full meaning of the *epoché* unambiguously. Husserl derived the metaphor for the operation of bracketing *(Einklammerung)* from mathematics. The underlying idea is to "detach the phenomena of our everyday experience from the context of our naive or natural living, while preserving their content as fully and as purely as

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[27] *Ibid.*, p. 685.

possible."[28] Using this procedure we suspend judgment as to the existence or non-existence of this content in order to be able to concentrate on the non-existential or essential content, the 'what,' of the phenomena.[29] Spiegelberg expresses his reservations regarding the value of the *epoché* understood as a "mere suspension of existential beliefs." It should be pointed out, however, that in Alfred Schuetz's treatment of the notion of multiple realities,[30] particularly in "the reality of the world of daily life" as contrasted with, for example, the world of dreams and the world of science, the *epoché* acquires a meaningful function.

7) *Interpreting concealed meanings.* This technique refers particularly to the method of Heidegger's hermeneutic phenomenology as found in *Being and Time*. Hermeneutics represents the attempt to discover hidden meanings of phenomena which are not immediately manifest to the operations of intuiting, analyzing, and describing. The interpreter has to use the given as a clue for meanings which lie beyond.[31] The danger in this approach is that the researcher will 'find' things which are not there to be found. In other words, hermeneutics may bring meanings to the surface which are only the products of the researcher's imagination. In the preceding chapter, it was shown that Strasser's definition of hermeneutics could be rephrased into the question: "What do I bring to the situation?" And so, it appears that Strasser's definition provides proper emphasis for Spiegelberg's critique.

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[28] *Ibid.*, p. 691.

[29] *Ibid.*

[30] Alfred Schuetz, *Collected Papers*, Vol. 1 (The Hague: Martinus Nijhoff), 1970, pp. 207-245.

[31] Herbert Spiegelberg, *ibid.*, p. 695.

Intersubjectivity

Cybernetic phenomenology represents a confluence of the interests of various modes of inquiry which use emics, the empathic approach, *Verstehen* (Max Weber), transpection (Maruyama), and intersubjective grasping, with the various techniques mentioned above. Cybernetic phenomenology employs a mode of observation which is 'intersubjective' rather than 'objective' in the sense of theoretical science. It is not necessary for the teacher to observe, for example, "the student's approach/avoidance responses."[32] As Merleau-Ponty said, another person is in principle accessible to me as I am to myself.[33] Or, in Husserl's words, "other people are immediately there for me . . . I understand immediately what they are sensing and thinking, the feelings that stir them, what they wish or will."[34] The reality of the intersubjective space does not have to be proven; we are aware of it immediately. Merleau-Ponty speaks about "the *a priori* unity of my experience, and experience shared with others." The following is a beautiful and 'striking' description of this *a priori* unity of experiences.

> Suppose that my friend Paul and I are looking at a landscape. What precisely happens? Must it be said that we have both private sensations, that we know things but cannot communicate them to each other—that, as far as pure, lived-through

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[32] See Chapter V, "Observing 'From the Outside' or 'From the Inside'."

[33] Maurice Merleau-Ponty, *The Structure of Behavior* (London: Methuen & Co., Ltd.), 1942, 1965, p. 222. See also Chapter V, *ibid.*

[34] Edmund Husserl, "The Thesis of the Natural Standpoint and its Suspension," *Phenomenology*, ed. Joseph J. Kockelmans (New York: Doubleday & Co., Inc.), 1967, p. 69. See also Chapter V, "Objects of Study."

> experience goes, we are each incarcerated in our separate perspectives—that the landscape is not numerically the same for both of us and that it is a question only of a specific identity? When I consider my perception itself, before any objectifying reflection, at no moment am I aware of being shut up within my own sensations. My friend Paul and I point out to each other certain details of the landscape; and Paul's finger which is pointing out the church tower, is not a finger-for-me that I *think of* as orientated towards a church-tower-for-me, it is Paul's finger which itself shows me the tower that Paul sees, just as, conversely, when I make a movement towards some point in the landscape that I can see, I do not imagine that I am producing in Paul, in virtue of some pre-established harmony, inner visions merely analogous to mine: I believe, on the contrary, that my gestures invade Paul's world and guide his gaze. When I think of Paul, I do not think of a flow of private sensations indirectly related to mine through the medium of interposed signs, but of someone who has a living experience of the same world as mine, as well as the same history, and with whom I am in communication through that world and that history.[35]

Because of the *a priori* unity of my experience with that of my companion; because of the fact that I can assume his perspective; i.e., his way of being-within-the-world,[36] because of this, I can participate in another person's orientation.

Thus, it is not sufficient for the teacher to treat his student as an organic system, whose internal orientation can be revealed by recording and analyzing his 'behavior' objectively. The learner is not given to the teacher as a mere object. He is given to the teacher 'immediately' as a subject. That is, the teacher has access not simply to a student's behavior but also to the way a learner experiences the instructional situation. A teacher who wishes to influence a learner's orientation must gain insight into the nature of the student's orientation.

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[35] Maurice Merleau-Ponty, *Phenomenology of Perception* (London: Routledge & Kegan Paul), 1946, 1970, p. 405.

[36] See earlier paragraphs in this chapter.

Perceiving another person involves an intentional act. From an analysis of this "intentionality" Sartre concludes that "its essence must be to refer to a primary relation between my consciousness and the Other's."[37] There is nothing mysterious in this kind of relation. It has common elements with the 'natural attitude' toward interpreting social reality; something which Max Weber referred to as *Verstehen* and which Alfred Schuetz elaborated as the method of observation peculiar to the meaningful world of the social sciences. This does not mean, however, that the 'natural standpoint' is by itself appropriate for "transpecting" another person's orientation. For that purpose, the structure of the phenomenon of orientation must be elucidated and to some extent this involves exactly a suspending of the natural standpoint.

The Phenomenon of Orientation

Merleau-Ponty remarked that phenomenology is accessible only through a phenomenological method. And, he said that "we shall find in ourselves, and nowhere else, the unity and true meaning of phenomenology."[38] In the following paragraphs an attempt is made to examine the concept of 'orientation' as a phenomenon. However, in the course of exploring the phenomenological literature and, particularly, the relatively scarce amount of studies of applied phenomenology, this writer has become impressed with the problems associated with employing the phenomenological method. It probably would take many years of study for a person to become proficient in the application of the various techniques. Only he who has experienced genuine perplexity and frustration in the face of the phenomena when trying to find the proper description for them, knows what phenomenological seeing really means, said Spiegelberg.[39] Thus, the following investigation of the phenomenon of orientation is only an attempt of an exploratory nature. A complete description of the phenomenon of 'orientation' would make use of the entire gamut of dialectical stances discussed above. In the following few pages nothing as thorough as this is attempted. The remainder of this chapter is devoted to some initial inquiry into the phenomenon of 'orientation,' i.e., its structure, its function and its meaning as an element of the instructional situation.

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[37] Jean-Paul Sartre, *Being and Nothingness* (New York: Philosophical Library, Inc.), 1956. On this basis Sartre proceeds to develop his marvellous and insightful dissertation on "the Look."

[38] Maurice Merleau-Ponty, *ibid.*, p. VIII.

In the following paragraphs, 'orientation' shall be understood as the referent in such phrases as "having an orientation," e.g., "a scientist has a special orientation toward the world"; or "the teacher and his students have completely different orientations with respect to that issue."

The term 'orientation' is meant to refer to the specific ways in which an individual looks at the world.[40] Concepts with roughly equivalent meanings are "worldview" *(Weltansschauung)*; Von Uexküll's ethological concepts of *Umwelt* and *Wirkwelt*, referring to orientations which are typical of specific species; the concept of orientation refers to the way in which individual actors define their "action-world" (Parsons); and it refers to the "general schemes" in terms of which the individual "defines his situation" (W. I. Thomas); in common language terms it includes the notions of "point of view", "perspective," a person's "way of looking at things," "outlook," "standpoint," and so on.

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[39] Herbert Spiegelberg, *ibid.*, p. 672.

[40] See also the introductory chapter of this study.

The term 'orientation' implies the 'facing toward' a specific direction. A person is always orientated in some way. And if, in a spatial sense, he feels disorientated, then he will actively try to reorientate himself in a desired direction by picking up clues from the world in which he finds himself. In this context the concept "orientation" is used as an equivalent term for 'direction.' For example, in his 'world of water' the sailor is equipped especially to determine his orientation. Thus, we hear phrases such as "shooting the sun," "boxing the compass," "taking one's bearings," "checking one's course," and also "asking the direction," "using directions," "showing the way."

Feelings of orientation and disorientation may come about in very different contexts, or more appropriately perhaps, in entirely different 'worlds.' Every specifiable world has its own referential center from which the inhabitant of that world orientates himself.

Whether the notion of 'orientation' has any scientific status in some behavioral theory of man is an irrelevant consideration for the present analysis. The question is whether the original referent of orientation is given to us existentially. That is, is the referent of the term 'orientation' something we experience? In order to determine whether the referent of the term 'orientation' can indeed be perceived "intuitively", we must look at situations where it refers to something immediately given.

There are a number of situations which reveal the existential referent of orientation with particular clarity. This happens in the disorientating experience, in the reorientating impulse, in the 'shift' from one orientation to another, in the feeling of being constrained by someone else's orientation and in the process of transpecting or partaking in another person's orientation (which shall be called here co-orientational grasping).

The disorientating and reorientating experience. In some 'worlds' our awareness of having or lacking an orientation is more astute. Thus, we may experience the disorientating impulse in 'worlds' as different as those of the dream, the big city, the mystery drama, the world of post-modern art, and the reality of hallucinogenic experiences. In the disorientating experience we stand at a 'cross-roads,' not knowing where to turn. A former prisoner, returning back to society, usually feels this acute sense of disorientation. His world, that he once knew so well, now seems to be a world of a different reality, and filled with things he no longer understands. Many people have had dreams in which they had to find their way out of situations. In such dreams, although places and spots seem to look familiar, they wander on and on, not finding the proper clues to help them.

> "I SHOULD see the garden far better," said Alice to herself, "if I could get to the top of that hill: and here's a path that leads straight to it—at least, no, it doesn't do

> that—" (after going a few yards along the path, and turning several sharp corners), "but I suppose it will at last. But how curiously it twists! It's more like a corkscrew than a path! Well, *this* turn goes to the hill, I suppose—no, it doesn't! This goes straight back to the house! Well then, I'll try it the other way."[41]

Anybody who has moved to an entirely different neighbourhood, a different city, or another country, knows the experience of feelings of displacement, estrangement and discomfort that usually are associated with such a move. But then, after awhile, things begin to appear less strange. We start recognizing streets and certain localities, and as this process continues we slowly become aware of a feeling of belonging and even comfort. After walking through alien portions of the city, it 'feels good' to arrive at a point where things are familiar again. I know my way about in this part and that makes this world feel more 'real.' Thus, in gaining an orientation my knowing, my feeling and my sense of reality are affected.

When a child moves to another school he may feel disorientated. And disorientation follows when I am trying to interpret an article but somehow cannot get the 'gist' of it. Sometimes a teacher deliberately plans a 'disorientating experience' for his students that has the effect of making them doubt something they hitherto unquestionably took for granted.

Shifts in orientation. Each orientation is experienced as internally consistent, while between or among orientations there are clear discontinuities. Moving from one orientation to another is experienced usually as a transition between two worlds, as a shift from one reality into another.

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[41] Lewis Carroll, *Alice's Adventures in Wonderland and Through the Looking Glass* (Harmondsworth, Middlesex, England: Penguin Books, Inc.), 1865, 1968.

As a student, I remember that upon entering an art class my orientation radically shifted from the one I had adopted during a biology lesson. During biology the teacher discussed the structure and function of the human hand. We observed the evolutionary characteristics in the hand bones of a primate, an Australopithecus, and in modern man. And we noted how there was the straightening of the fingers in this series, and a broadening and lengthening of the last *phalanx* of the thumb. The advances in the opposability of the thumb and the related hand musculature perfected this remarkable organ of manipulation. However, then I walked into an art appreciation class. Some students chuckled as if caught by surprise: there, on the teacher's desk was a marvelous replica of Rodin's sculpture of the Praying Hands. The sensitive fingers, extending upwards in a devoted plea, transcended their instrumental function. How miraculously they expressed their earth-bound spirituality! I experienced the shift in orientation that came over me. I was in a different world with its own reality, its own values, feelings and beliefs. How inappropriate it would be to think of the *saddle joint*, the *abductor pollicis* or the *evolution of the last phalanx of the pollex*. How could something so familiar as a hand be a member of such different realities? Taking my place in the classroom I put my books down and involuntarily regarded my own hands. What strange objects if you thought about it! My own reflections took me back to the poetry of Rainer Maria Rilke.

This author recalls how he once, in reaching under the table for something he had dropped, saw his own hand, groping. And for a moment, it was as if this 'thing' was leading a life of its own. It became a foreign object, a being of a different world, acting on its own mysterious impulse. I pondered about this curious phenomenon of being so alienated from something so typically human as a hand. How sensitive the man Rilke must have been to become aware of this experience and describe it in such poetic language that it left an indelible impression upon my mind. I tried to recall the exact words the poet used but the art teacher had started to speak. A quick glance at my neighbour told me that he had opened his book at a chapter on sculpture. The teacher was holding up Rodin's carving and again I was aware of a shift in orientation occurring from the reality of my private imagination to the reality of the classroom.

School study subjects such as English, mathematics, art, social studies, physics, music and biology all have their own orientation: their own realities, conceptual systems and realms of values. This is reflected, not only in the different language and style of these subjects but also in the moral attitude of the participant toward the other subject areas. Over the witty ridicule of the mathematics instructor we disdainfully laughed at the supposed profundities of psychology. And with the psychology teacher, we mockingly joked about the frustrated attempt of the mathematically-minded to reduce the world of physics to mere numbers. Teachers sometimes are so 'set' in their professional orientation, to the extent that any form of interdisciplinary thinking is utterly alien to them. The socially organized knowledge structures of their particular subject area has become a restraining conceptual system with its own language, its own validation procedures, and its own areas of interest.

Alfred Schuetz speaks of "experiences of shock," when we move from one reality (he talks about "province of meaning") into another. There are as many shock experiences as there are different realities, in which a person partakes. Some examples Schuetz provides are:

> . . . the shock of falling asleep as the leap into the world of dreams; the inner transformation we endure if the curtain in the theatre rises as the transition into the world of the stage-play; the radical change in our attitude if, before a painting, we permit our visual field to be limited by what is within the frame as the passage into the pictorial world; our quandary, relaxing into laughter, if, in listening to a joke, we are for a short time ready to accept the fictitious world of the jest as a reality in relation to which the world of our daily life takes on the character of foolishness; the child's turning toward his toy as the transition into the play-world; and so on. But also the religious experiences in all their varieties—for instance, Kierkegaard's experience of the "instant" as the leap into the religious sphere—is such a shock as well as the decision of the scientist to replace all passionate participation in the affairs of "this world" by a disinterested contemplative attitude.[42]

Co-orientational grasping. Co-orientational grasping refers to the situation in which one person partakes in an orientation of another person. This happens spontaneously in a story-telling situation where the raconteur pulls his audience into a reality of fiction. Co-orientational grasping occurs when a parent is playing with a child and momentarily suspends his beliefs in ordinary reality in exchange for the beliefs and feelings of the world of the child. In a child's reality, things are believed and valued which are insignificant in the world of the adult.

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[42] Alfred Schuetz, *On Phenomenology and Social Relations* (Chicago: The University of Chicago Press), 1970, pp. 254-255.

In a very perceptive study, M. J. Langeveld[43] describes the 'hidden' place in the world of the child. The 'hidden' place comes to life in the little children's verse by Milne: "In a corner of the bedroom is a great big curtain, / Someone lives behind it, but I don't know who; / I think it is a Brownie, but I'm not quite certain, / etc.[44] At home, there are 'hidden places' such as the attic, the closet, the stairs, and behind the curtain where the child in a very normal way can live the experience of entering into a strange and unknown world. Only the perceptive parent who still can remember something of his or her own early youth may be able to grasp the meaning of the otherwise seemingly bizarre beliefs and feelings of that special reality.

Of course, co-orientational grasping occurs in the classroom when, for example, the social studies teacher lets the students 'live' through some historical event; or when the teacher introduces the students to the world of the 'Black experience,' e.g., by playing the blues or by reading first-hand accounts of what it means to live as a 'Black' in a 'White' world, or by playing a simulation game. Thus, co-orientational grasping is built into the teacher-learner relation. The point is, however, that the teacher can make much more effective use of this relation if he manages to arrive at a reflective knowledge of the structure and function of the notion of orientation. It simply is not enough to make use of an orientation; one also must understand the nature of having an orientation (or, of having *this* specific orientation) and how it is being used. Questions the teacher must ask himself are with reference to the nature of the orientation of the world of the student. What kind of reality do these young people live in? what is the nature of their beliefs? and what is considered valuable and important within their orientation toward the world and, specifically, with respect to their orientation toward the school?

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[43] M. J. Langeveld, "De Verbogen Plaats in het Leven van het Kind," *Persoon en Wereld*, eds. J. H. van den Berg en J. Linschoten (Utrecht: Erven J. Bijleveld), 1963, pp. 11-32.

[44] A.A. Milne, *When We Were Very Young* (New York: Dutton), 1961.

Co-orientational grasping occurs spontaneously during our interactions with our fellowmen. However, the grasping of another person's orientation tends to be confounded with the characteristics of our own orientations. Our own orientation functions essentially to selectively attend to certain aspects of our life-world. (In later paragraphs the structure of some general and some more specific orientations will be considered.) When we listen to a person elaborating a set of ideas or a system of knowledge, we often do not fully attend to what he 'really' is saying. On the contrary, we immediately tend to interpret a belief or a feeling partly from our own perspective. That is, our own orientation stands in the way of a true co-orientational grasping of another person's meanings, intentions, feelings, and so on. So that, in order to be able to grasp another person's orientation, I must first grasp, in a reflective act, my own orientation. I temporarily must 'suspend' my own orientation if I wish to fully co-orientate myself with the way of viewing, believing and valuing of another person. And this is possible only after I have gained an insight into the structure and nature of my own orientation.

Teachers and students often are keenly aware of the peculiar influence and the constraining effect that the other's orientation may have on his or her mind. For example, as a high school student I am aware of my teacher's orientation when, for example, I am doing my homework. I am reading an article or interpreting a text and I cannot help but interpret this writing as, I believe, my teacher would interpret it. Similarly, when I am writing an essay the teacher always is looking over my shoulder, as it were. Even when I am in the privacy of my own den, the teacher is still 'standing behind me.' There is no doubt that I write this essay for this teacher and that the nature of my essay 'figures' in his orientation.

Particularly during the preactive and interactive phases of teaching, the teacher very deliberately may try to 'tune in' to the orientation that his students have toward the substance of his teaching. And this deliberation reflects a traditional concern of didactics, which urges the teacher to be 'relevant' with regard to the students' interests, motivations, capabilities, and so on.

The preactive phase of teaching—that is, the stage in which instructional objectives, instrumental content, and strategies are consolidated[45]—could be described as the stage of rehearsal. The teacher mentally rehearses the instructional process in an act of protention or anticipation. However, as was seen in the earlier parts of this chapter, this act of protention is a normal aspect of the process of spontaneous reflection. A higher level of reflection is reached if the teacher simply does not 'plan' but transcends this planning by reflecting on it. In this process the teacher deliberately inquires into how the orientation of the student is constituted and how it is confounded with his own orientation toward the anticipated transactions. Preactive teaching is therefore not just a mental rehearsal but a reflective (or better, perhaps, a self-reflective) rehearsal of the transactional stage of instruction.

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[45] Ted Aoki, "Controlled Change: A Crucial Curriculum Component in Social Education," Paper presented at the Annual Conference of the National Council for the Social Studies, Denver, Colorado, Nov. 26, 1971.

The interactive stage of teaching has been described as a devising of displays, mainly on the part of the teacher, and as transactive and interactive negotiations among learners and display and teacher.[46] It is evident that co-orientational grasping among the communicants of the concrete instructional situation is particularly crucial for an effective exchange of ideas, beliefs, values and feelings which will hopefully lead to learning. While presenting, explaining, discussing, etc., the good teacher is continuously trying to see the instructional situation through the eyes of the learners, as it were. This is a spontaneous internal process, which can be made more effective (presumably) if the teacher can indeed acquire an 'objective' knowledge of his own knowledge of this ongoing affair.

The structure of orientation. Each orientation has its own style, in a similar sense as Alfred Schuetz talks about "cognitive styles." However, the word 'orientation' is used here to emphasize the fact that

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[46] *Ibid.*

'style' in the present context refers to the typical manner in which an individual experiences the entire realm of metaphysical, epistemological and axiological dimensions of an orientation. An orientation is 'constituted' metaphysically, epistemologically and axiologically. That is, each orientation constitutes a specific mode of being-in-the-world, each with its own particular reality, beliefs, and field of relevancies. An individual is always characterized by being orientated toward a specific part of his world in a special way. In other words, there are different modes of being orientated and every one of us participates some of the time in such different modes of orientation. It is likely that some individuals have a greater facility for partaking in a greater variety of orientations and for 'shifting' from one orientation to the other. It is possible to describe a number of general orientations, each of which shows some distinct modes of being-in-the-world. That is, there are general and special modes of being orientated toward the world.

Some general modes of orientation that immediately come to mind are, for example, found in 1) the ordinary life-world of work and living, 2) the world of the scientist, 3) the world of ideal relations, and 4) the world of the supernatural orientation.

1) *The mode of everyday thinking and acting.* This is the world of secondary qualities which exist, as it were, on the surface of things: colors, sounds, taste, beauty, etc. Alfred Schuetz has devoted much of his time in analyzing phenomenologically the "life-world" of work and everyday living. The world of daily life is the orientation of the wide awake, grown-up person who acts in it and upon it, amidst his

fellowmen. And this orientation is experienced within the natural attitude. Consequently, this world is typically taken for granted; this means that the structures of daily life are not themselves recognized and formally analyzed by common sense. Thus, the world of everyday reality is a 'general essence' in the sense that we all share this world without knowing its structural properties. Each individual locates himself in daily life in a particular manner which constitutes his "biographical situation."[47] That is, the way common-sense reality gets translated into the form of a personal or a biographical situation, depends on the totality of experiences, the history an individual builds up in the course of his concrete existence.

2) *The scientific mode.* This is the orientation of the 'disinterested observer' of the physical and/or social world. The scientist as 'scientist' has temporarily suspended his belief in the everyday reality of secondary qualities. He is not engaged in the world out of practical interest but out of cognitive interest. He views the world theoretically, i.e., things and events are being abstracted onto a meta-level where they can be 'really' understood, explained and predicted. What is ordinarily—under the natural attitude—taken for granted, now is being doubted systematically. The scientist is confronted with scientific problems which may be of only trivial relevancy in the everyday life-world of common sense. Thus, the scientist is guided by a different system of relevancies. The scientific orientation typically is rationalistic, employing methods of logical reasoning. Problems

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[47] Alfred Schuetz, *ibid.*, p. 73.

which are otherwise reacted to emotionally and spontaneously, are now considered reflectively, according to accepted categorical and methodological devices.

In school, the scientific orientation is adopted, particularly in the (advanced) physical science classes. But also in the biological and social science courses problems are defined and studied from the theoretical point of view. It must be understood, however, that what is considered to be a relevant conception and solution of a "problem" in a social studies class may (and often does) lose its relevancy in the shift from this particular orientation to another. Just as I suspend my belief in the world of 'atoms' and 'molecules' when I enjoy a good meal at home, so do I suspend my belief in the 'dialectics' of 'societal forces' when I watch the eleventh hour news on the television set.

To illustrate how sharp the discontinuities often are between the 'theoretical' and the 'practical,' one may contrast the theoretical orientation of a scientist doing experiments on live animals such as dogs, and the ordinary life-world orientation of the same scientist at home toward his pets.

Insofar as the *New Social Studies* with its emphasis on 'value education' is concerned, one may note an implicit problem associated with the fact of discontinuities between the various orientations. The scientific orientation typically is characterized as involving a 'disinterested' and 'rationalistic' attitude toward its object of study. In class, however, during a study session on, let us say, Marxism, a student is asked to involve himself 'personally' with the aim to form 'value commitments' and practical 'opinions.'

The fact is that, as a social scientist, I may be convinced that a Neo-Marxist theory best 'explains' relevant social science 'problems,' while as a husband and father I may have a different orientation toward the same 'social problem' translated into the context of relevancy of everyday living, feeling and acting.

3) *The world of ideal relations.* There is the orientation of ideal relations or abstract truths which are expressed in logical, mathematical, metaphysical, ethical, or esthetic propositions. More specific orientations subsumed under this general class refer to the worlds of the mathematician, the professional moralist, the artist, and so on. In a fascinating article,[48] Maruyama develops a theory of paradigmatology in which he demonstrates that different communities (or cultures) of people make use of different structures of reasoning. In this paper, he compares three kinds of paradigms which are representative of special modes of thinking. The model most typical of the history of western civilization is the "unidirectional causal paradigm" which Maruyama contrasts with the "mutual causal paradigm" which is more characteristic of the minds of Japanese and Navajo cultures. The abstract relations underlying each of these paradigms manifest themselves in thought patterns as different as the categories of ideology, esthetics, ethics, religion, logic, decision processes, and so on.

4) *The supernatural mode.* Then there is the supernatural orientation, with its subsuming realities of the various religious worlds,

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[48] Magoroh Maruyama, *ibid.*

the world of the mystic, the drug-user, or even the temporary realities of the world of surrealistic art. Various realities may be superimposed as in the 'magic realistic cinema' of Luis Bunuel, in the novels of Franz Kafka, in the surrealistic paintings of artists as different as Salvador Dali and Paul Delvaux, or in the 'acid-rock' music of the English pop-group, Pink Floyd. Emerging oneself in such reality may have a total 'disorientating' effect *vis-à-vis* the common-sense reality of the ordinary life-world. For example, every time we read a novel we 'shift' from ordinary reality to the reality of the book. That 'shift' can often be distinctly felt, as when, for example, someone suddenly starts talking to us so that we feel we are 'pulled away,' as it were, from a different world. That the reality of every life is dominant over the reality of the novel is proven by the fact that I cannot help but be 'taken away' from my book if some outside noise coercively 'commands' my attention. And thus, it comes about that we can say such things as Joseph K.[49] did not 'really' get 'accused' and 'convicted,' even though he was apparently found guilty. While absorbing ourselves in Kafka's novel *The Trial*, we measure the strange things that take place in the life of Joseph K. against the absolute reality of the world of Joseph K. When we interrupt our reading, however, we find a still more real world, which reduces Kafka's reality to the realm of fiction. As long as I have adopted the orientation of Joseph K., the protagonist in Kafka's *The Trial*, everything that happens in the book is experienced within the reality of that orientation (which may be experienced as a magical or supernatural reality). As soon as I interrupt my reading, I 'shift' back to the orientation of the daily life-world and the reality of Joseph K. is now seen as 'only a book story.' Similarly, when a father takes his child to a movie that appears to contain some gruesome and anxiety-provoking scenes, and the father senses that the child is overcome by feelings, he will say, "Look, it is only a picture." He means to say, what is real and anxiety laden on the screen is not really real, and you, my child, can relieve your anxieties if you only shift back to the real world of everyday thinking and acting.

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[49] Franz Kafka, *The Trial* (New York: Schocken Books), 1937, 1969.

How is it possible to speak of different realities? What does the nature of reality consist of in the first place? And what are the conditions for the production of reality? William James' treatment of such questions probably has not been surpassed in terms of the profound insights it reveals. What is more, James frequently has been heralded as an independent originator of the phenomenological approach. His brilliant studies[50] read still as the best phenomenology can offer at this moment in time.

Believing and reality. "Everyone knows the difference between imagining a thing and believing in its existence, between supposing a proposition and acquiescing in its truth."[51] It is in this way that William James begins his examination of reality. Our sense of reality takes the form of 'belief.' At the same time, however, this belief, or sense of reality is a sort of feeling more allied to the emotions than to anything else. It is in the acquiescence of belief, according to Williams James, that the mental state or function of cognizing reality is found; the term acquiescence refers to the 'emotion' of conviction that is associated with such a belief.

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[50] William James, *The Principles of Psychology*, Vols. I and II (New York: Dover Publications, Inc.), 1890, 1950.

[51] *Ibid.*, Vol. II, p. 283.

Thus, reality, belief, and emotion are all aspects of the same thing: 'orientation.' Every orientation has its own reality for the mere fact that it consists of beliefs and emotions related to these.

Our natural impulse is to affirm immediately the reality of all that is conceived, as long as it remains uncontradicted. We never disbelieve anything except for the reason that we believe something else which contradicts the first thing.[52] The true opposites of belief, psychologically considered, are doubt and inquiry, not disbelief.[53] Belief stands to reality as disbelief stands to unreality.

As a rule we believe anything we cognize within a particular orientation. For example, within the reality of the Christian religion, everything is believed so long as it does not contradict other beliefs within that reality. Thus, it would be impossible to believe in the existence of only one God and many Gods at the same time. However, within a monotheistic orientation it may still be possible to pray to many Saints. When we represent things quite unsystematically they seem to conflict little with each other, and the number of beliefs we may hold in this chaotic manner is practically limitless.

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[52] *Ibid.*, p. 284.

[53] *Ibid.*

Any thought that remains uncontradicted is *ipso facto* believed and automatically posited as absolute reality. The feeling that any orientation within which we merge is unreal can only come about when that orientation is superimposed onto another orientation; this may happen in the 'shift' from one orientation to another where the first one 'lingers on.' While it is 'engaged' each orientation is real, i.e., is believed, in its own 'style.' The reality only lapses when we shift orientations.

William James appeals to Franz Brentano when he points out that the mere thought of an object such as the unicorn may exist as something quite distinct from the belief in its reality.

> Every object comes into consciousness in a twofold way, as simply thought of *(vorgestellt)* and as admitted *(anerkannt)* or denied . . . Nothing is ever desired without being thought of; but the desiring is nevertheless a second quite new way of receiving it into consciousness. No more is anything judged (i.e., believed or disbelieved) which is not thought of too. But we must insist that, so soon as the object of a thought becomes the object of an assenting or rejecting judgment, our consciousness steps into an entirely new relation towards it. It is then twice present in consciousness, as thought of, and as held for real or denied; just as when desire awakens for it, it is both thought and simultaneously desired.[54]

It is one thing to hold a thought in consciousness, for example the notion of 'social class,' and another to believe, disbelieve or have doubts regarding the existence of 'social classes.' Furthermore, one may have different beliefs regarding the meaning of the concept 'social class.' That is, the attributes adhered to this concept may be as different as the views of Karl Marx, Lloyd Warner, Max Weber, or Talcott Parsons. For example, in Lloyd Warner's conception of the term

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[54] Franz Brentano, in William James, *ibid.*, p. 286.

'social class,' is a reality in the sense that he believes in the existence of six categories of different social classes. In contrast, the economic conception of social class in the theory of Marx cannot be 'seen,' although this does not make the concept less 'real' for individuals of the Marxist orientation. Of course, for the philosophical individuals, who can think only of society as composed of 'individuals' not 'classes,' the concept 'social class' is just as much a product of the imagination as is the concept of 'unicorn.'

Thus, it is possible to think of 'the same' differently and when we have done so, we can choose which way of thinking to adhere to and which to disregard.[55] According to William James,

> . . . all propositions, whether attributive or existential, are believed through the very fact of being conceived, unless they clash with other propositions believed at the same time, by affirming that their terms are the same with the terms of these other propositions . . . The subjects adhered to become real subjects, the attributes adhered to real attributes, the existence adhered to real existence; whilst the subjects disregarded become imaginary subjects, the attributes disregarded erroneous attributes, and the existence disregarded an existence in no man's land, in the limbo "where footless fancies dwell."[56]

Under what circumstances do we think things real? And how does one reality come to dominate over another? Experiences which establish themselves in our consciousness as elements of an orientation must possess certain qualities, so that these experiences are believed in and considered real. From William James it was learnt that, the more a conceived object excites and stimulates us, the more reality it has. James draws up a list of other qualities which determine the success with which a contradicted belief may establish itself in consciousness, or, for the purpose of the present discussion, within an 'orientation.'

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[55] William James, *ibid.*, p. 290.

[56] *Ibid.*, pp. 290-291.

(1) Coerciveness of attention, or the mere power to possess consciousness—a property characteristic of objects of sensation;

(2) Liveliness, or sensible pungency, especially in the way of exciting pleasure or pain;

(3) Stimulating effect in the way of arousing acting impulses;

(4) Emotional interest, as object of feelings of love, dread, admiration, desire, etc.;

(5) Congruity with other beliefs and feelings, and

(6) Independence in terms of causal importance.[57]

It appears that "coerciveness of attention" comes first, since most people in our culture tend to feel the primacy of the reality of sensory objects above others. However, it very well is possible that in other cultures the reality of everyday life orientation is governed by categories lower on James' list. This is an existential, or a radical empirical question which could be ascertained phenomenologically, i.e., with a methodology that employs an ethnographic technique which I would call 'radical emics.' Carlos Castaneda has demonstrated the effectiveness of such an approach. William James does not refer to the phenomenon of 'orientation' but his notion of multiple realities is implicated in the idea of multiple orientations. Each orientation has an independence *vis-à-vis* other orientations. That is why we can speak of the reality of the novel, the reality of the classroom, the reality of scientific thinking, and so forth. Every distinct reality corresponds to an orientation which, as was shown above, has its own epistemological 'style' in terms of the congruency of characteristic beliefs, values and feelings.

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[57] *Ibid.*, p. 300.

For most people the everyday life orientation assumes primacy over others. But some individuals are so submerged in a particular reality that they seldom revert or shift back to the reality of the ordinary life-world. These individuals are identified as the eccentric artist, the meditating mystic, the absent-minded professor, or even as the schizoid and the insane. Schizophrenia is now considered to be a rather common phenomenon. Behaviors associated with adolescence, drug-use, etc., are viewed as manifestations of schizoid persons. A schizophrenic may be seen as a person who is 'caught up' in a particular orientation which can be described in terms of its own reality, dominant thought patterns, and emotional adherents.

What is real in one orientation is unreal in another. We become aware of this when, for example, somebody is purposefully trying to 'disorientate' the congruency of our beliefs. As from a painted hook it has been said that one can only hang a painted chain; so, conversely, from a real hook only a real chain can properly be hung.[58] Little did William James suspect, when he uttered this statement, that the Pop-Artists of the twentieth century employed exactly this device to arouse their public. Contemporary artists have experimented with combining into a single display traditional techniques with unusual techniques. Surrealism and magic realism arrive at their effects by combining into the single reality of a painting, components which belong in separate realities. And Pop-Artist Jim Dine actually hangs real objects from painted hooks or, conversely, painted objects from real hooks. The effect this art has on the public is that of puzzlement, disorientation, amazement, doubt, and all the feelings of scorn, amusement, or disgust which such states evoke. I remember that as students, a friend and I found great delight in observing the reactions of people to the early forms of Pop-Art in the respectable museums of Amsterdam. However, since the mid-fifties much of this art has lost its 'shock effect' merely as a result of the fact that such art has established itself as an independent orientation with its own 'style' within the world of artistry.

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[58] *Ibid.*, p. 298.

Closing Comments

As was remarked above, a more complete study into the phenomenon of orientation would involve working with teachers, students and classroom observers. Tape recorded interviews could yield texts which illustrate how teachers are aware of the significance of the existence of orientations and of the device of co-orientational grasping on an experiential level.

As was shown in the preceding paragraphs, there are general and more specific orientations. As a member of a specific epistemic community or subculture the student shares orientational characteristics with others of his generation. Social scientists have given educators of their time insight into the life-world, the reality, belief systems, and values of the contemporary generation of young people. For example, Schelsky[59] offers a fascinating description of the young generation in Germany between 1945 and 1955. He calls it the "skeptical generation" and he describes patterns of identification, the experience of leisure time, the life-world in school and at home, and so on. Bednarik[60] did a similar study about the life-world of the young worker, the proletariat. And in North America David Riesman[61] made his study of the changing American character in his book *The Lonely Crowd*. More recent studies of the life-world of an entire subculture of young people have been done by men such as Kenneth Keniston,[62] Edgar Friedenberg,[63] Erik Erikson,[64] Theodore Roszak,[65] Paul Goodman,[66] and so on.

The study of the phenomenon of orientation further can be enriched through case studies of the manner in which individual students transact with social studies instrumental content, for example. The observer would attempt to follow one particular student at a time through an entire series of adaptive transactions. The learner's orientation would be described as accurately as possible. All types of instructional communications with teacher and other learners would be recorded and transcribed into a different set of statements using, for example, the techniques of ethnomethodology. The purpose of such a technique is to analyze the concrete meanings of messages exchanged between communicants. Rather than simply recording and coding the messages such as in the way of interaction analysis, the underlying question always is, what 'really' is being communicated? In terms of the speaker *(Ausdruck)*, topic *(Darstellung)*, and listener *(Appell)* functions of the interactional process, the question may be specified as: what really is being said? what literally is being said? and what really is being heard? In fact, using the ethnomethodological technique, cybernetic phenomenology makes possible a new kind of interaction analysis that, I believe, has never been attempted. It is a radical approach to interaction analysis in the sense that it does not abstract, i.e., it does not develop codes for the text of the dialogues. Instead it enriches, clarifies and describes the existential meaning of the information exchanges, verbal and nonverbal.

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[59] Helmut Schelsky, *Die Skeptische Generation* (Dusseldorf: Diederichs), 1960.

[60] Karl Bednarik, *Der Junge Arbeiter von Heute - Ein Neuer Typ* (Stuttgart: G. Kilpper), 1953.

[61] David Riesman, *The Lonely Crowd* (New Haven: Yale University Press), 1950.

[62] Kenneth Keniston, *The Uncommitted* (New York: Dell Publishing Co., Inc.), 1960, 1965. Kenneth Keniston, *Young Radicals* (New York: Harcourt, Brace & World, Inc.), 1968.

[63] Edgar Z. Friedenberg, *The Vanishing Adolescent* (New York: Dell Publishing Co., Inc.), 1959, 1968.

[64] Erik H. Erikson (ed.). *The Challenge of Youth* (New York: Doubleday and Co., Inc.), 1965.

[65] Theodore Roszak, *The Making of a Counter Culture* (New York: Doubleday and Co., Inc.), 1969.

[66] Paul Goodman, *Growing Up Absurd* (New York: Random House, Inc.), 1956, 1960.

It is not theoretical knowledge but experiential knowledge of teachers and learners in which the investigator is interested. The question these individuals ask themselves is, how do I experience orientational phenomena? And, more importantly, how do I experience my experience of it? How does it function in my teaching or in my learning?

It is an empirical question whether teachers can be trained, during pre-service or in-service sessions, in the complete method and meaning of cybernetic phenomenology. However, once the teacher has grasped the method of reflecting on his own orientations, the method of suspending this particular orientation, and the method of co-orientational grasping, he has acquired already an ability which possibly may make him a more effective teacher in concrete instructional situations.

Chapter VII

THE SORCERER'S APPRENTICE

Literature as a Resource of Experience

In his study *De Psychologie van de Roman*, Buytendijk has presented a convincing case for the value of the novel in understanding human phenomena. For the artist as well as for the phenomenologist the source of all work is the experiential life-world of man. Just as the poet or the novelist attempts to grasp the essence of some experience in a literary form, the phenomenologist attempts to grasp the essence of some experience in a phenomenological description. It is not surprising, therefore, that through the use of literary material in a phenomenological study one often finds rich detail. Buytendijk devoted an entire study to the analysis of some aspects of the human condition through his study of the novels of Dostoyevsky. Buytendijk said that among all novels of world-literature, the creative works of Dostoyevsky are the best training-school for psychological development and the richest source for that kind of psychological knowledge that understands man as situated in a human reality and in the fulness of his experiences.

The value of the literary novel does not lie in its analytical or scholarly contribution for understanding social and psychological processes. Rather, 'good' literature serves as a 'resource of experiences' to which the social scientist may turn in order to increase his practical insights. The psychological value of a novel is determined by what may be called the perceptiveness and the intuitive sensitivity of the author. In a novel, phenomena such as love, poverty, achievement, frustration, the gaining of knowledge and change of feelings can be experienced as modes of being-in-the-world. A genuine artistic expression, says Buytendijk, is not just representational or imitational of some phenomena in the world. Rather, it transcends the experiential world in an act of reflective existence. The novel irresistably shifts the existence of the reader from his everyday life orientation to the world of the novel where experiences can be shared in a co-orientational grasping of the creative imagination.

The point is that through carefully selected literature the educator, just like the psychologist, may increase his practical knowledge of teaching-learning phenomena. In fact, the idea of using literary sources in a phenomenological study has already been put forward in Chapter VI during the discussion of the methodological principle of dialectics. The difficulty is to identify suitable works which elucidate essential aspects of the teaching-learning relation. Examples of this type of work may be found in the category of literature produced by educators such as A. S. Neill[1] and Jonathan Kozol.[2] Essentially an artist recreates experiences by transcending them. Therefore, genuine art makes available to the phenomenological method a wealth of resources. Through a good novel, for example, a person is given the chance of reliving an experience which provides him with the opportunity of gaining insight into a certain aspect of the human condition, by reflecting on it such as through the use of the phenomenological method. For example, Jonathan Kozol's book, *Death at an Early Age*, has such literary power that it yields the teacher a fundamental grasp of what it means to teach in an urban ghetto school. A social science article which, with the help of statistics, may relate patterns of achievement, ability, student background, and teaching methods in the ghetto school cannot possibly yield the same kind of understanding. Kozol's approach is descriptive in the sense that he recreates in narrative form his teaching experiences. Phenomenology could provide for even greater insights by treating the experience of the ghetto school thematically and systematically. Transcending an experience systematically is in itself an experience, i.e., an experience of an experience, and this attempt reflects in a sense the phenomenological attitude.

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[1] A. S. Neill, *Summerhill* (New York: Hart Publishing Company), 1960.

[2] Jonathan Kozol, *Death at an Early Age* (New York: Bantam Books, Inc.), 1967.

A rather unique series of literary studies has been written by Carlos Castaneda which could be of special interest for educationists.

Introductory Notes

In the summer of 1960, Carlos Castaneda, an anthropology student at UCLA, was undertaking research for his thesis on peyote and the use of medicinal plants by Indians of Mexico and the American Southwest. While waiting for a bus in an Arizona border town, he met don Juan Matus, an old Yaqui Indian from northwest Mexico. Don Juan was an exceptionally powerful 'man of knowledge': a *brujo*, or Sorcerer. And for the next ten years or more Castaneda became his Apprentice in what appears to be an entirely different system of knowledge. Castaneda wrote down field notes of nearly every transaction or experience he had with don Juan. He selectively arranged these field notes into what he considers a coherent and descriptive account of his apprenticeship under the guidance of his teacher Juan Matus. This account is viewed as three anthropological studies written with such narrative power and lucidity that they have promptly become bestsellers, both in hardcover and in paperback editions.[3] While there is some controversy with respect to the authenticity and the accuracy of Castaneda's reports, his books generally have been hailed as literary works of very high esthetic quality. Carlos Castaneda made the cover story of *Time* magazine under the title "Don Juan and the Sorcerer's Apprentice." Very appropriately the term 'Sorcerer's Apprentice' signifies a special teacher-learner relation which will be examined in the following pages.

Why should Castaneda's work be relevant for phenomenological analysis? How does cybernetics play a role in the selection of this particular work? The point is, it seems to me, that the relational phenomenon 'Sorcerer-Apprentice' represents a concept of instruction that is clearly rooted in a cybernetic metaphor, namely, the notion of communication. Upon reading Castaneda's book, *Journey to Ixtlan* (which shall be treated as the source for the present study), it becomes evident that the book constitutes one fascinating 'dialogue' between teacher and learner in a cybernetic sense. On a more abstract level this dialogue is conceived of as a unique communication system, which displays just about every characteristic that was dealt with in Chapter IV. It is evident in the book that don Juan throughout his teaching very skillfully manipulates the instrumental contents of his teaching in such a way as to bring about feelings of fundamental uncertainty in Castaneda. And regardless of how bizarre the *display* characteristics are of the *information* engendered by the teachings of don Juan, it always is clear that Castaneda's *transactions* with that information are of a highly *selective* or personal nature. The knowledge at which Castaneda arrives is personal knowledge. Not even don Juan could have foreseen what the exact nature of that knowledge would be. That is, the teaching-learning process was not governed by the simple unidirectional paradigm of means-end relationships of some contemporary teaching models (see Chapter V). Rather, the nature of the apprenticeship of Castaneda under the guidance of don Juan only can be understood in terms of adaptive processes described by Maruyama's concept of "second cybernetics" and "deviation-amplifying mutual causal processes." Inherent in the relationship between Sorcerer and Apprentice was a fundamental complexity which made predictions regarding specific learning outcomes practically impossible. Castaneda's reactions to the content of his experiences always were significant indications, tokens, or omens for the teacher don Juan, which made the latter act upon his student or upon the display with which Castaneda was transacting. Therefore, regarding its specific nature, the outcome for any particular learning event was couched in uncertainty. That is, learning was contingent on incidental happenings which could cause the instructional sequence to take unexpected turns and result in unique outcomes.

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[3] Carlos Castaneda, *The Teachings of Don Juan: a Yaqui way of Knowledge* (New York: Ballantine Books, Inc.), 1969. *A Separate Reality: Further Conversations with Don Juan* (New York: Simon and Schuster, Inc.), 1971. *Journey to Ixtlan: The Lessons of Don Juan* (New York: Simon and Schuster, Publishers), 1972.

The Sorcerer-Apprentice relation is characterized by a triadic structure: there is a teacher, a learner and the substance that transpires between the two. That is, the teacher and the learner are both orientated in some way toward one another, and they are each in a unique and personal way orientated toward some affair that becomes existentially accessible through the instrumental content of a display. This is the essential structure of any teaching-learning experience.

A simple conceptual analysis of the logical structure of the teaching-learning experiences from the *Journey to Ixtlan* would show how a functional explanation of instructional processes can be given. The teacher acts on the student in such a way that the student will experience the situation in an instructional way. The student has to transact with the instructional display in such a manner that the teacher realizes that the student experiences the situation in an instructional sense. By 'tuning in' to these transactional experiences the teacher can exercise a kind of control over the situation. In a formal explanation, a causal loop (mutual causal process) can be seen to exist between the student and the teacher, between the student and display, and between the teacher and display. Further causal loops exist in the relationships between the subject and the object 'self' of the ego of the learner. The student is orientated in some way toward his environment, and as long as no changes take place in this relationship the student-display system is in steady-state. However, it is precisely the teacher's aim to increase the tension in some homeostatic variable of this system in order to set off a structure increasing, new equilibrium seeking, adaptive learning process.

Don Juan used the following methods to bring about an instructional situation: 1) he would create a 'tension' in Castaneda's self concept, i.e., in the way Castaneda used to see himself; 3) don Juan would create a 'tension' by disturbing Castaneda's orientation toward some internal or external object; and 3) he would create a 'tension' by manipulating the display with which they were transacting and thus effect a disorientating change in Castaneda's sense of reality, his beliefs and his feelings.

The following discussion of Castaneda's work is offered with serious hesitation. A truly phenomenological description acquires a level of authenticity which is very difficult to attain for a beginning author. It is hoped, therefore, that the following paragraphs will be read as a modest and exploratory effort in looking at the relationship between teacher and learner.

Journey to Ixtlan

The task in these pages is to concentrate on the experiential aspects of the teaching-learning relationship, and not to resort to formal explanations which belong to theories of learning or theories of teaching. The referent of the phenomenon the 'Sorcerer's Apprentice' is taken to be found in the peculiar teaching-learning experiences that are being described in Castaneda's novels. In a sense, the reader of *Journey to Ixtlan* becomes a witness to the experiences as they are told by Castaneda. Through reading the book one can experience in a co-orientational manner the encounters and experiences of Castaneda with his teacher. By reflecting on these experiences some essential aspects may be identified which describe the phenomenon of the 'Sorcerer's Apprentice' and are characteristic of the relationship between a master teacher and his pupil. That is, the relationship 'Sorcerer-Apprentice' can be viewed analogously with the relationship between a master teacher and his student.

The attempt in the following paragraphs is to suspend all previous scientific knowledge regarding processes of instruction and to focus primarily on the experiential characteristics of the phenomenon the 'Sorcerer's Apprentice' as it is found in Castaneda's notes of his encounters and experiences with don Juan. It would seem that the nature of the relationship between don Juan and Castaneda is characterized by many contingent factors. At the same time, however, there is much in this relationship that would ideally be found in any teaching-learning situation. Based on my own reflections on these experiences I can distinguish seven essential aspects in the teaching-learning relationship as it is recounted in *Journey to Ixtlan*. It is in this sense, I think, that a phenomenological description has immediate value for the educator. It shows him at a level of authentic experiences what is essential about some phenomenon. Thus, the phenomenon 'Sorcerer's Apprentice' may be viewed as an example of a relation of instruction. I would hope that a perceptive teacher can benefit a great deal from reading Castaneda's excellent book. The admirable calling of a teacher to become a 'master teacher' can find new inspiration through books such as *Journey to Ixtlan*.

1. *A Sorcerer Has Special Knowledge*

Goethe's poem, "The Sorcerer's Apprentice," has the well-known theme that it is dangerous to play with magic. Sorcery is a two-edged sword that sooner or later will cut its owner. Ever since Simon Magus thought he made an honorable and natural offer when he bargained with Saint Peter for his miraculous powers, Christianity has considered simony as a sin to which Dante consigned the worst punishment at the very bottom of his Hell, and which contracted Faust into his ill-fated relationship with Mephistopheles. In the following pages the interest in the phenomenon the 'Sorcerer's Apprentice' is not to be interpreted with reference to any kind of white or black magic that is associated with the term. It is true, however, that all knowledge which enables an individual to gain more effective control over his environment may seem somewhat incomprehensible and magical to an outsider. The search for knowledge which yields special insights and special power has been at the base of much learning and a legitimate expression of man's curiosity.

A 'Sorcerer,' then, is a person who possesses 'special knowledge' which yields him an effective control over his environment. Castaneda describes a man of knowledge as a man who has access to power, and who can see and do things ordinary people cannot do.

The first encounter between the anthropology student and the old Indian is a striking experience. It immediately results in a deep-seated respect of Carlos Castaneda for don Juan. Castaneda, addressing the Indian in a self-confident manner, tells him that he has studied a great deal about peyote at the university in Los Angeles and that he wishes to ask him a few questions.

> The old man shook his head slowly, and I, encouraged by his silence, added that it would no doubt be profitable for us to get together and talk about peyote.
>
> It was at that moment that he lifted his head and looked me squarely in the eyes. It was a formidable look. Yet it was not menacing or awesome in any way. It was a look that went through me. I became tongue-tied at once and could not continue with the harangues about myself. That was the end of our meeting. Yet he left on a note of hope. He said that perhaps I could visit him at his house someday.[4]

We sometimes recognize that there is something about a particular teacher that sets him apart from others. It may be anything that is striking in his behavior. Such was don Juan's look which numbed Castaneda to the point that he could not think coherently. "I became thoroughly intrigued with that stupendous look and decided to search for him." Don Juan possessed the qualities of a powerful teacher. He did not listen simply to what Castaneda had to say to him; he immediately understood the true meaning of Castaneda's talk. There is a difference between the literal meaning and the purposive meaning of a statement or question, between what is said and what is meant. Don Juan heard what Carlos really was saying and the latter became tongue-tied upon the sudden realization that he could not fool don Juan with the same easy half-truths and social talk that 'civilized' people put on to please their own egos and those of others. When after six months Castaneda sets out to pay don Juan a first visit at this house, he makes an effort to establish a more honest rapport than occurred during their initial meeting in the bus depot.

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[4] *Ibid., Journey to Ixtlan: The Lessons of don Juan* (New York: Simon and Schuster, Publishers), 1972, p. 8.

> We exchanged social courtesies for a while and then, in plain terms, I confessed that I had been very devious with him the first time we had met. I had boasted that I knew a great deal about peyote, when in reality I knew nothing about it. He stared at me. His eyes were very kind.
>
> I told him that for six months I had been reading to prepare myself for our meeting and that this time I really knew a great deal more.
>
> He laughed. Obviously, there was something in my statement which was funny to him. He was laughing at me and I felt a bit confused and offended.[5]

The experience of Carlos is very much like that of the naive school or university student who walks into a new class and who cannot yet see that this particular teacher is destined to be of special significance for his future life. The student merely expects to make notes and to learn the kind of knowledge that was announced in the information calendar or the course syllabus. Instead, the student's fundamental outlook on the world, his very mode-of-being will become affected by the personality of this teacher. Don Juan's teachings were aimed at bringing about fundamental changes in Castaneda's orientation toward the world. Now, it seems that with this note an essential characteristic of a 'master' teacher has been identified. A master teacher possesses a kind of knowledge that is not had easily by other people. Such a teacher is unique in the sense that he has a thoughtful and sophisticated orientation toward some aspect of the world. A master teacher's knowledge is a potential gift to his pupil. This is probably the classical concept of a real teacher.

From the very outset Castaneda repeatedly pleaded with Juan Matus to become his informant. But don Juan always had evaded any direct commitment to this effect. He had even suggested that "perhaps there is nothing to learn about plants, because there is nothing to say about them." Only after reading the third book, *Journey to Ixtlan*, does it become clear that Castaneda for many years had not understood what it was that don Juan wanted to teach him. The first book, *The Teachings of Don Juan*, deals almost entirely with the uses of hallucinogenic plants: peyote, jimson weed, and a sacred mushroom. The very concept of "seeing" which was the central theme of the book, *A Separate Reality*, remains connected to the reality of the psychotropic experience. This does not mean, however, that Carlos Castaneda did not attempt to interpret the teachings in some systematic fashion. Particularly, during the writing of his first study, which formed his Master's Thesis, Castaneda had searched intensively to find some system around which the many pages of field notes could be organized. The last seventy-five pages in *The Teachings of Don Juan* present a structural analysis of his apprenticeship.

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[5] *Ibid.*, p. 19.

However, it was not until Castaneda understood the full meaning of the central concept of don Juan's teachings, "seeing" and "stopping the world," that he could have written *Journey to Ixtlan* which constitutes a fundamental reinterpretation of his period of apprenticeship. It was this final experience that put his many years of apprenticeship into proper perspective.

With remarkable ploys and in subtle ways don Juan lets Carlos know that the latter is coming to him with the wrong questions and with the wrong expectations. One day Castaneda arrives with a genealogy and kinship charts and begins to interview don Juan for ethnographic data.

> I began with the kinship charts.
>
> "What did you call your father?" I asked.
>
> "I called him Dad," he said with a very serious face.
>
> I felt a little bit annoyed, but I proceeded on the assumption that he had not understood.
>
> I showed him the chart and explained that one space was for the father and another space was for the mother. I gave as an example the different words used in English and in Spanish for father and mother.
>
> I thought that perhaps I should have taken mother first.
>
> "What did you call your mother?" I asked.
>
> "I called her Mom," he replied in a naive tone.
>
> "I mean what other words did you use to call your father and mother? How did you call them?" I said, trying to be patient and polite.
>
> He scratched his head and looked at me with a stupid expression.
>
> "Golly!" he said. "You got me there. Let me think."
>
> After a moment's hesitation he seemed to remember something and I got ready to write.
>
> "Well," he said, as if he were involved in serious thought, "how else did I call them? I called them Hey, hey, Dad! Hey, hey, Mom!"
>
> I laughed against my desire. His expression was truly comical and at that moment I did not know whether he was a preposterous old man pulling my leg or whether he was really a simpleton. Using all the patience I had, I explained to him that these were very serious questions and that it was very important for my work to fill out the forms. I tried to make him understand the idea of genealogy and personal history.
>
> "What were the names of your father and mother?" I asked.
>
> He looked at me with clear kind eyes.
>
> "Don't waste your time with that crap," he said softly but with unsuspected force.
>
> I did not know what to say; it was as if someone else had uttered those words. A moment before, he had been a fumbling stupid Indian scratching his head, and then in an instant he had reversed the roles; I was the stupid one, and he was staring at me with an indescribable look that was not a look of arrogance, or defiance, or hatred, or contempt. His eyes were kind and clear and penetrating.
>
> "I don't have any personal history," he said after a long pause. "One day I found out that personal history was no longer necessary for me and, like drinking, I dropped it."[6]

A Sorcerer is a person who, in Don Juan's words, has built a fog around himself by erasing his personal history. If people have "figured you out" completely, then this means that they can pin you down, anticipate your doings. "I personally like the ultimate freedom of being unknown," said don Juan. "No one knows me with steadfast certainty, the way people know you, for instance." There is no doubt that Castaneda got to know don Juan as a sympathetic, kind and helpful teacher. Throughout the study don Juan comes alive as a real and warmly protective person with his own peculiar traits and for whom Castaneda develops a sensitive fondness. At the same time, however, don Juan manages to remain surrounded by an aura of personal mystery and unpredictability which expresses itself in his peculiar magnetism and charm. Almost everyone probably once has had a teacher who stood out in this way. That is, this teacher was able to become a real person in the relationship with his students without, however, losing his magical charm of originality and his always surprising depth of wisdom.

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[6] *Ibid.*, pp. 27-29.

It is his very system of knowledge which makes don Juan such a unique person. It becomes a challenge to Castaneda to become a member of that knowledge system. In the light of this larger purpose Castaneda's initial intention, namely, the gathering of information on medicinal plants became inconsequential. Don Juan's knowledge of the world is, to some extent at least, incompatible with the ordinary life-world orientation of Castaneda's biographical background. After five years of apprenticeship Castaneda writes:

> I can say now, with the perspective of the five years that have elapsed, that at that time don Juan's teachings had begun to pose a serious threat to my "idea of the world." I had begun to lose the certainty, which all of us have, that the reality of everyday life is something we can take for granted.[7]

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[7] *Ibid. The Teachings of Don Juan: a Yaqui way of Knowledge* (New York: Ballantine Books, Inc.), 1969, p.

And another five years later Castaneda concludes:

> The termination of the apprenticeship meant that I had learned a new description of the world in a convincing and authentic manner and thus I had become capable of eliciting a new perception of the world, which matched its new description. In other words, I had gained membership [into another system of knowledge].[8]

2. *Special Knowledge Cannot be Taught Directly—It Has to be Acquired in a Personal Experience*

Castaneda's intention simply was to gather information about peyote, using familiar research techniques of anthropological field work. Even after he had spent a number of visits with don Juan, Carlos still did not see that don Juan's knowledge about peyote could not be collected with paper and pencil.

> After a long, uneasy silence I boldly asked him, "Would you teach me about peyote, don Juan?"
> He said that my intentions alone were not enough, and that to know about peyote—he called it "Mescalito" for the first time—was a serious matter. It seemed that there was nothing else to say.[9]

Don Juan is not interested in communicating mere factual knowledge about plants; on the contrary, he asserts that if Castaneda wishes to find out about plants, the way to this knowledge would require significant changes in Castaneda's entire orientation.

The problem is that the full meaning a concept possesses in a specific cultural community can be understood only through participation in the life-world which is characteristic of this community. This participation involves a mode of being-within-the-world which extends into all three orientational dimensions discussed in the preceding chapter: including the peculiar sense of reality, beliefs, ideas, feelings and relevancies which provide norms for decisions and which make people act in certain ways. A fundamental idea, I think, that is to be found in Castaneda's study is the recognition of the fact that these more important learnings which involve an alteration of a person's ordinary life-world orientation, cannot be communicated in the predominantly verbal ways of traditional teaching. The amount of control by a teacher can be only as great as the capacity of the two-way communications channel between him and the learner. That is, the matters that can be taught and learned via a lecture or oral presentation are probably relatively inconsequential for a person's mode of being-in-the-world, i.e., his thinking, feeling and acting. Significant learning is a result of a personal experience involving emotions and beliefs. Personal knowledge that is significant for one's further actions comes about by being engaged in a total experience. A master teacher simply does not communicate intellectual messages, rather he communicates knowledge by placing the student in situations where he will seek and find a personal control (emotionally and intellectually) of some problematic aspects of his environment. In almost every phase of his teaching, don Juan's approach is to create situations in which Castaneda is taken through a series of experiences, often with unpredictable outcomes. Being a man of knowledge, don Juan can handle any unexpected situation with confidence. Castaneda often becomes very frustrated because rather than telling him what he is supposed to learn, don Juan wishes him to learn in the course of some personal experience.

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[8] *Ibid.*, *Journey to Ixtlan: The Lessons of Don Juan* (New York: Simon and Schuster, Publishers), 1972, p. 14.

[9] *Ibid.*, p. 70.

> "The trick is to feel with your eyes," he said. "Your problem now is that you don't know what to feel. It'll come to you, though, with practice."
>
> "Perhaps you should tell me, don Juan, what I am supposed to feel."
>
> "That's impossible."
>
> "Why?"
>
> "No one can tell you what you are supposed to feel. It is not heat, or light, or glare, or color. It is something else."
>
> "Can't you describe it?"
>
> "No. All I can do is give you the technique. Once you learn to separate the images and see two of everything, you must focus your attention in the area between the two images. Any change worthy of notice would take place there, in that area."[10]

Castaneda continuously attempted to state his own uncertainties to don Juan and tried to clarify his puzzlements which always were at the roots of his experiences. Teaching is creating uncertainties and puzzlements. In an act of co-orientational grasping the teacher temporarily suspends his own beliefs and feelings, and he looks at the world 'as if' he is puzzled in the same authentic way the learner is. This happens when Genaro makes Castaneda's car to disappear.

> "Where's my car?" I asked, addressing both of them.
>
> "Where's the car, Genaro?" don Juan asked with a look of utmost seriousness.
>
> Don Genaro began turning over small rocks and looking underneath them. He worked feverishly over the whole flat area where I had parked my car. He actually turned over every rock. At times he would pretend to get angry and would hurl the rock into the bushes.
>
> Don Juan seemed to enjoy the scene beyond words. He giggled and chuckled and was almost oblivious to my presence.
>
> Don Genaro had just finished hurling a rock in a display of sham frustration when he came upon a good-sized boulder, the only large and heavy rock in the parking area. He attempted to turn it over but it was too heavy and too deeply imbedded in the ground. He struggled and puffed until he was perspiring. Then he sat on the rock and called don Juan to help him.
>
> Don Juan turned to me with a beaming smile and said, "Come on, let's give Genaro a hand."

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[10] *Ibid.*, p. 75.

"What's he doing?" I asked.

"He's looking for your car, don Juan said in a casual and factual tone.

"For heaven's sake! How can he find it under the rocks?" I protested.

"For heaven's sake, why not?" don Genaro retorted and both of them roared with laughter.

We could not budge the rock. Don Juan suggested that we go to the house and look for a thick piece of wood to use as a lever.

On our way to the house I told them that their acts were absurd and that whatever they were doing to me was unnecessary.

Don Genaro peered at me.

"Genaro is a very thorough man," don Juan said with a serious expression. "He's as thorough and meticulous as you are. You yourself said that you never leave a stone unturned. He's doing the same."

Don Genaro patted me on the shoulder and said that don Juan was absolutely right and that, in fact, he wanted to be like me. He looked at me with an insane glint and opened his nostrils.

Don Juan clapped his hands and threw his hat to the ground.

After a long search around the house for a thick piece of wood, don Genaro found a long and fairly thick tree trunk, a part of a house beam. He put it across his shoulders and we started back to the place where my car had been.

As we were going up the small hill and were about to reach a bend in the trail from where I would see the flat parking area, I had a sudden insight. It occurred to me that I was going to find my car before they did, but when I looked down, there was no car at the foot of the hill.

Don Juan and don Genaro must have understood what I had had in mind and ran after me, laughing uproariously.

Once we got to the bottom of the hill they immediately went to work. I watched them for a few moments. Their acts were incomprehensible. They were not pretending that they were working, they were actually immersed in the task of turning over a boulder to see if my car was underneath. That was too much for me and I joined them. They puffed and yelled and don Genaro howled like a coyote. They were soaked with perspiration. I noticed how terribly strong their bodies were, especially don Juan's. Next to them I was a flabby young man.

Very soon I was also perspiring copiously. Finally we succeeded in turning over the boulder and don Genaro examined the dirt underneath the rock with the most maddening patience and thoroughness.

"No. It isn't here," he announced.

That statement brought both of them down to the ground with laughter.

I laughed nervously. Don Juan seemed to have true spasms of pain and covered his face and lay down as his body shook with laughter.[11]

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[11] *Ibid.*, pp. 284-286.

3. *A Sorcerer is a Master of Reality*

In the face of puzzlement and uncertainty Castaneda's most obvious problem was his persisting inclination to 'explain' all his experiences within the systems of orientation he was accustomed to. For a Sorcerer, reality, or the world we all know, is only a description. He lets you see a different world, that is, he changes your relationship with the world.

> "Don't tax yourself trying to figure it out," don Juan said as if he were reading my thoughts. "The world is a mystery. This, what you are looking at, is not all there is to it. There is much more to the world, so much more, in fact, that it is endless. So when you are trying to figure it out, all you are really doing is trying to make the world familiar. You and I are right here, in the world that you call real, simply because we both know it. . ."[12]

The essence of being a Sorcerer is not situated in the ability to perform tricks or hocus-pocus. Rather, a Sorcerer is to be viewed as a master of reality. He can make you see and believe things in an entirely different manner than you have been used to. A Sorcerer is a master of reality who can make us contradict the things we always have held for real. By the same token he is a man who can emotionally convince us to believe in a different reality. In this sense, a master teacher is one who has a profound effect on one's sense of being-in-the-world. For don Juan, ordinary reality, or the world we all know, was only a description. He was to teach Carlos a new description. What is the essential characteristic of this teaching? In trying to understand don Juan's actions Castaneda had to take into account don Juan's specific goals which Castaneda himself did not share. Thus, the intrinsic relevancies of don Juan's orientation became Castaneda's imposed relevancies. It further appears that a consistent acting as if some specific orientation were real, believable and valuable will bestow upon this orientation an actual sense of reality and importance. By consistently acting as if don Juan's description of the world was real this description grew into such a strong connection with Castaneda's life, with his habits and his emotions, that his interests in it became those which characterize a person's orientation. For example, by making him do things such as talking to plants, and thanking the fog for received favors don Juan instilled in Castaneda a sense of reality, belief and value in the peculiar orientation toward the world of the Sorcerer. The intoxicating effects of hallucinogenics suited the purpose of deepening Castaneda's sense of don Juan's description of reality and the beliefs and feelings which were gained therein. Drugs made things appear more utterly what they were—more "utterly utter" said James—within a particular experience of reality. Don Juan provided Castaneda with hallucinatory experiences in order to assist him in the task of suspending his ordinary belief in the natural world.

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[12] *Ibid.*, p. 168.

4. *An Apprentice Must be Made to Want to Learn*

In ordinary classroom teaching often only token respect is paid to the *emotional* involvement of the student in the learning process. The key to successful instruction indeed may be situated in the teacher's ability to mobilize the learner emotionally. In order to realize how important the role of emotion is in the process of learning one is reminded of James who once said that man is a speck of reason in an ocean of emotion. A master teacher finds ways in which to mobilize his student emotionally into a state of wanting to become involved in an activity in which he has to adapt himself to prepared and contingent events. Without fail don Juan managed to involve Carlos emotionally in some situation. That is, some particular experience don Juan had planned always became existentially relevant to Castaneda. For this purpose don Juan demonstrated a remarkable gift to become attuned to Castaneda's thinking and feelings. This happened, for example, when don Juan started to tell Carlos a little parable. Castaneda had heard the story before although he did not tell this to don Juan and instead chose to listen patiently for the punch line. But then don Juan changed the punch line in such a way that it aroused a high level of curiosity in Castaneda.

> He made another pause and looked at me with a mischievous glint in his eyes. This time he had turned the tables on me. The young man's confession was a new element and I no longer knew how the story would end.
>
> "Well, what happened then?" I asked, truly interested.
>
> "The young man was killed instantly, of course," he said and broke into a roaring laughter.
>
> I liked very much the way he had entrapped my interest; above all I liked the way he had linked that story to my own case. In fact, he seemed to have constructed it to fit me. He was making fun of me in a very subtle and artistic manner. I laughed with him.[13]

Castaneda's experiences were of two kinds: either they were with reference to the way in which he saw himself (his self-concept) or they were with reference to the way in which he saw the world.

Don Juan's methods of teaching seemed to be as follows: He would make Castaneda aware of the manner in which he (Castaneda) saw himself. Next he would criticize that self-concept by forcing Castaneda to to realize how he (don Juan) saw Castaneda, and how he (don Juan) saw Castaneda seeing himself. Castaneda felt a distinct admiration for don Juan, his style of thinking and acting. And, of course, he did not like to think of himself negatively. Therefore, upon realizing how don Juan saw him and how don Juan saw him seeing himself, Castaneda would usually get quite upset. The result would be Castaneda admitting that don Juan's perception of him was correct and a subsequent desire on Castaneda's part to do something about it. Through this process of interpersonal transacting don Juan instilled in Castaneda a desire to learn.

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[13] *Ibid.*, p. 21.

> "But I am happy with my life, don Juan. Why should I have to change it?"
>
> He began to sing a Mexican song, very softly, and then hummed the tune. His head bobbed up and down as he followed the beat of the song.
>
> "Do you think that you and I are equals?" he asked in a sharp voice.
>
> His question caught me off guard. I experienced a peculiar buzzing in my ears as though he had actually shouted his words, which he had not done; however, there had been a metallic sound in his voice that was reverberating in my ears.
>
> I scratched the inside of my left ear with the small finger of my left hand. My ears itched all the time and I had developed a rhythmical nervous way of rubbing the inside of them with the small finger of either hand. The movement was more properly a shake of my whole arm.
>
> Don Juan watched my movements with apparent fascination.
>
> "Well . . . are we equals?" he asked.
>
> "Of course we're equals," I said.
>
> I was, naturally, being condescending. I felt very warm towards him even though at times I did not know what to do with him; yet I still held in the back of my mind, although I would never voice it, the belief that I, being a university student, a man of the sophisticated Western world, was superior to an Indian.
>
> "No," he said calmly, "we are not."
>
> "Why, certainly we are," I protested.
>
> "No," he said in a soft voice. "We are not equals. I am a hunter and a warrior, and you are a pimp."
>
> My mouth fell open. I could not believe that don Juan had actually said that. I dropped my notebook and stared at him dumbfoundedly and then, of course, I became furious.

> He looked at me with calm and collected eyes. I avoided his gaze. And then he began to talk. He enunciated his words clearly. They poured out smoothly and deadly. He said that I was pimping for someone else. That I was not fighting my own battles but the battles of some unknown people. That I did not want to learn about plants or about hunting or about anything. And that his world of precise acts and feelings and decisions was infinitely more effective than the blundering idiocy I called "my life."
>
> After he finished talking I was numb. He had spoken without belligerence or conceit but with such power, and yet such calmness, that I was not even angry any more.
>
> We remained silent. I felt embarrassed and could not think of anything appropriate to say. I waited for him to break the silence. Hours went by. Don Juan became motionless by degrees, until his body had acquired a strange, almost frightening rigidity; his silhouette became difficult to make out as it got dark, and finally when it was pitch black around us he seemed to have merged into the blackness of the stones. His state of motionlessness was so total that it was as if he did not exist any longer.
>
> It was midnight when I finally realized that he could and would stay motionless there in that wilderness, in those rocks, perhaps forever if he had to. His world of precise acts and feelings and decisions was indeed superior.
>
> I quietly touched his arm and tears flooded me.[14]

It appears that questions that can fruitfully be asked about teaching-learning experiences are summarized as follows:

How does the student see himself?

How does the teacher see the student?

How does the student see the teacher seeing him?

How does the teacher see the student seeing him?

How does the teacher see the student seeing himself?

How does the student see the teacher seeing him seeing himself?

At other times don Juan would place Castaneda in a situation where he (Castaneda) would have to transact in some way with some object. This object could be an internal object such as dreams or reflections on thoughts or feelings. Or the object would be located outside Castaneda such as an animal, a piece of fog, a landscape or a rock. Don Juan would 'tune in' to Castaneda's experiences and by effecting some change in the transaction he would force Castaneda to re-orientate himself to this aspect of the world. For example, don Juan would influence Castaneda's perception of an external object through some suggestive method.

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[14] *Ibid.*, pp. 80-82.

> "What happened?" I asked, completely out of breath.
>
> "I think the animal is dead," he said.
>
> We advanced cautiously towards the animal. It was sprawled on its back. As I came closer to it I nearly yelled with fright. I realized that it was not quite dead yet. Its body was still trembling. Its legs, which were sticking up in the air, shook wildly. The animal was definitely in its last gasps.
>
> I walked in front of don Juan. A new jolt moved the animal's body and I could see its head. I turned to don Juan, horrified. Judging by its body the animal was obviously a mammal, yet it had a beak, like a bird.
>
> I stared at it in complete and absolute horror. My mind refused to believe it. I was dumbfounded. I could not even articulate a word. Never in my whole existence had I witnessed anything of that nature. Something inconceivable was there in front of my very eyes. I wanted don Juan to explain that incredible animal but I could only mumble to him. He was staring at me. I glanced at him and glanced at the animal, and then something in me arranged the world and I knew at once what the animal was. I walked over to it and picked it up. It was a large branch of a bush. It had been burnt, and possibly the wind had blown some burnt debris which got caught in the dry branch and thus gave the appearance of a large bulging round animal. The color of the burnt debris made it look light brown in contrast with the green vegetation.
>
> I laughed at my idiocy and excitedly explained to don Juan that the wind blowing through it had made it look like a live animal. I thought he would be pleased with the way I had resolved the mystery, but he turned around and began walking to the top of the hill. I followed him.[15]

At other times don Juan would disturb Castaneda's sense of some internal object, such as the subjective experience of dreaming and what can be considered 'real' or 'unreal.'

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[15] *Ibid.*, pp. 131-132.

> His weird logic was overwhelming. His words created visions of myself succumbing to something awesome and unknown, something which I had not bargained for, and which I had not conceived existed, even in my wildest fantasies.
>
> "What do you propose I should do?" I asked.
>
> "Become accessible to power; tackle your dreams," he replied. "You call them dreams because you have no power. A warrior, being a man who seeks power, doesn't call them dreams, he calls them real."
>
> . . . "Do you mean then, don Juan, that dreaming is real?"
>
> "Of course it is real."
>
> "As real as what we are doing now?"
>
> "If you want to compare things, I can say that it is perhaps more real. In dreaming you have power; you can change things; you may find out countless concealed facts; you can control whatever you want."
>
> . . . "What do you call this, what we're doing now?" I asked, meaning that what we were doing was reality as opposed to dreams.
>
> "I call it eating," he said and contained his laughter.
>
> "I call it reality," I said. "Because our eating is actually taking place."
>
> "Dreaming also takes place," he replied, giggling. "And so does hunting, walking, laughing."
>
> I did not persist in arguing. I could not, however, even if I stretched myself beyond my limits, accept his premise. He seemed to be delighted with my despair.[16]

Questions with reference to transactional teaching-learning experiences via the display are:

How does the teacher transact with the display?

How does the student transact with the display?

How does the teacher transact with the student transacting with the display?

5. *Teaching is Sharing*

> "Why are you doing all this for me, don Juan?" I asked.
> He took off his hat and scratched his temples in feigned bafflement.
>
> "I'm having a gesture with you," he said softly. "Other people have had a similar gesture with you; someday you yourself will have the same gesture with others."[17]

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[16] *Ibid.*, pp. 119-121.

[17] *Ibid.*

The best way in which don Juan's teachings seem to be characterized is with the term 'sharing.' Don Juan and his friend don Genaro taught Castaneda through a gesture of a sharing experience. Sharing an experience is an empathic process. Don Juan simply did not plan Castaneda's learning experiences; he also participated in Castaneda's experiences.

In a sense the teacher learns with the learner. During his teachings the teacher persistently attempts to understand the way in which an instructional experience appears and feels to the learner. A master teacher is capable of seeing the world of the learner from the inside. That is, he perceives the learner's world 'as if' it were his own. This does not mean that the teacher identifies with the learner to the point that he forgets being a teacher. The teacher practices a constant shifting back and forth from teacher to learner orientation, in the same sense as it is possible for the literary critic, for example, to shift back and forth from the reality *of* the book to the reality *about* the book he is reviewing. Instruction becomes [illegible] co-active experience, i.e., teacher and learner are co-orientated toward some aspect of the life-world in which they co-exist. Actions and responses of the learner are grasped by the teacher in a co-orientational gesture. It is in this manner that instruction always constitutes a teaching experience and a learning experience for the teacher. A teacher attempts to sense the way in which his teachings are experienced by the learner. Teaching, therefore, constitutes a reflective experience of an experience and out of this situation further acts of teaching ensue. In this process the teacher always asks himself about the learner: What does he experience? What does he feel? What does he think? and, How is the learner aware of his own thinking and feeling?

6. *Consequential Teaching Makes a Difference*

Castaneda went to don Juan to seek the kind of information that he expected to find as a student of anthropology. Instead he received something quite different, something much more valuable and consequential, namely, a whole new way of looking at the world, a fundamentally different orientation. Throughout his teachings, in subtle and in not so subtle ways, don Juan lets Castaneda realize that there is a profound difference between a man of knowledge and an ordinary person. In order to be able to understand about plants, don Juan says, one must change one's way of looking at the world drastically. 'Consequential learning' makes a person think, act and feel differently; it alters his very sense of what is real, what is believable and what is important. Personal knowledge that is consequential does not mean only a 'knowing that,' it also refers to a 'mode-of-being.' Learning that is of consequence involves a person's self-concept and his mode of being-in-the-world; that is, it affects the way he relates to himself, to others and to things and events in the world around him.

In the final chapter of *Journey to Ixtlan*, the fantastic impact of don Juan's teaching impressively comes across in Castaneda's marvelously recounted experience of "stopping the world" and in Genero's sensitively narrated encounter with his "ally." The system of knowledge that don Juan taught Castaneda is so all pervasive that afterwards, in Genaro's words, nothing is any longer the same. Here is an anthropologist whose apprenticeship with a Yaqui Indian made him a completely different person. Few teachers ever can hope to have such a profound effect on their students.

7. *Teaching-Learning as Creating and Resolving Binds*

Instruction may be viewed as a form of communication between teacher and learner which aims at the creation and the solution of what R. D. Laing has called "knots" or "binds." Binds are forms of communicational bondages which people experience in their transactions with themselves, with each other, and with objects of their environment. Laing has presented examples of such binds in the form of condensed and poignant statements. A bind occurs, for example, when the learner's concept of himself is not the same as the way he sees his teacher seeing him. In this case the learner will usually try to either change the way the teacher sees him (seeing himself) or the learner will try to change his own self-concept. It was shown above how don Juan used the device of placing Castaneda in such binds. For instance, at one time he made Castaneda feel that he had to prove himself 'worthy of power.' At another time he would force Castaneda to reconsider his feelings of self-importance.

Binds that occur quite commonly are phrased as follows:

If I don't know I don't know
I think I know.
Or,
If I don't know I know
I think I don't know.[18]

The former of these two binds characterizes Castaneda's first two publications. By the end of 1971, Castaneda believed he had experienced "seeing," the central concept in don Juan's teaching. However, when Carlos returned to don Juan for another year of apprenticeship he underwent experiences which made him realize that he had misinterpreted his earlier learning period. By the end of his last association with don Juan it happened that Castaneda accomplished "stopping the world." The experience of "seeing" was still outside his reach.

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[18] R. D. Laing, *Knots* (Harmondsworth, Middlesex, England: Penguin Books Ltd.), 1972.

In the following paragraphs the essential components of the binds occurring in the relationship between don Juan and Castaneda have been listed in the order in which they were formed and resolved.

A Sorcerer sees something
    that the Apprentice cannot see (yet)
Although the Apprentice does not see
    that there is something he cannot see.

Furthermore,
The Sorcerer realizes that he cannot simply tell
    the Apprentice what it is that
he sees
    that the Apprentice cannot see he cannot see.

Because
(1) Whatever the Sorcerer sees
and the Apprentice cannot see he cannot see
    must be experienced
    to be seen
(2) The Sorcerer realizes that
what the Apprentice cannot see he cannot see
    is a "personal" seeing
    which only the Apprentice could see
    if he could see it.

The Sorcerer's first problem, therefore,
    is NOT to make the Apprentice see
    what it is
    he (the Sorcerer) sees
Rather, his initial concern
    is to try to get the Apprentice to realize that
    there is something
    he (the Apprentice) cannot see he cannot see
    and to make the Apprentice see that
    he (the Sorcerer) for himself sees
    what the Apprentice for himself cannot see he cannot see.

Now, there are two possibilities
Either the Apprentice
can be made to realize
that he cannot see he cannot see
what the Sorcerer sees
Or the Apprentice
cannot be made to realize
that he cannot see he cannot see
what the Sorcerer sees.

The Apprentice cannot be made to see
that he cannot see
if he thinks
he sees already (and he is stubborn)
or if he has a lack of ability.

(In the last instance,
the Apprentice ceases to be an Apprentice
because of a lack of ability
to see
that he cannot see).

If the Apprentice is stubborn
then the Sorcerer must attempt
to make the Apprentice doubt
he thinks he sees
whatever he thinks that he sees
the Sorcerer sees.

If the Apprentice can be made to see
that he cannot see
(what the Sorcerer sees
the Apprentice cannot see)
then the Apprentice must be made to want to see
what he cannot see
(This is a matter of motivation)
The Sorcerer must make it desirable
for the Apprentice to come to see
what he cannot see yet.

Once the Apprentice wishes to see
what he cannot see
the Sorcerer must prepare learning experiences
through which the Apprentice eventually for himself may see
what the Sorcerer for himself sees.

After the Apprentice has learned to see
what he couldn't see before
it has become possible
for the Sorcerer and his Apprentice
in a verbal communication
to share experiences about
whatever it is
they now both see.

Almost everybody once had a teacher who made a fundamental impact on his or her outlook onto the world. A phenomenological description of one's experiences with that teacher may provide insights into the essential aspects which characterize such relationship. I believe that Castaneda's books and a phenomenological description of them may 'strike a responsive chord' with those who are interested in pursuing the essential aspects of the relationship between a master teacher and his student. The above discussed aspects of the teaching-learning relationship between don Juan and Castaneda could be described further. The intention, however, was to conduct an initial and modest exploration into the phenomenon "Sorcerer's Apprentice."

Chapter VIII

CONCLUSION AND RECOMMENDATIONS

Conclusion

In this study an attempt was made to contrast a cybernetic orientation with a phenomenological orientation in the study of teaching-learning phenomena. And further, an attempt was made to combine the thematic domain of cybernetics with the methodology of phenomenology. The question is, how successfully do cybernetics and phenomenology enter the partnership that was suggested by the title of this study? The point could be raised that phenomenology did receive much more attention and emphasis than cybernetics did, in the explication of the complementary relationship denoted by the term 'cybernetic phenomenology' (see Chapter VI). However, the latter comment does not necessitate the conclusion that cybernetic phenomenology as an orientation in the study of teaching-learning phenomena is, therefore, nonviable. The cybernetic view of teaching and learning conceives of instruction as a system which, like a *Gestalt*, is more than teaching or learning considered independently. On an existential level the structure of this communication system is seen to consist of a set of dialogues between teacher, learner and display. The conclusion would be that cybernetic phenomenology selects its phenomena from a restricted domain of interest. It is true that phenomenology seems to 'take over' once a phenomenon has been selected. It is essential to the phenomenological method that during its application every other explanatory system is suspended.

Outside the domain of instructional cybernetics there are other phenomena which probably would be of interest to educators. For example, there is the distinction between 'absolute time' and 'experiential time' which has been of interest to phenomenologists. Timetable scheduling of teaching-learning modules has always been done on the basis of the 'absolute time' concept. The issue becomes somewhat confounded, however, in the debate of what should be considered the proper length of time for classroom sessions. Some say that ninety minute classroom lessons are less disturbing to the school and waste less time; others believe that a lesson should never exceed thirty minutes. The simple fact is that, in terms of absolute time intervals, it matters less how long any particular lesson lasts. It is more important how the student *experiences* the time lapse in any particular kind of class. Interesting studies could be carried out in this area. It appears that considerations such as the above lead to the conclusion that phenomenology *an sich* may constitute a promising orientation in the study of teaching-learning phenomena, with or without the adjective 'cybernetics' attached to it.

From the initial exploration into the area of instructional cybernetics I conclude that cybernetics presents a powerful scientific and epistemological thesis for the understanding of teaching-learning phenomena. I am more reserved, however, regarding the usefulness of this thesis for the practicing teacher. It was argued in Chapter III that the cybernetic orientation toward the teaching-learning situation is based on an abstracted view of man. In its aim and in the language and methods it employs, science can be expected to deal with research problems and with questions such as those concerning the discovery of inductive generalizations, the lawfulness of teaching-learning phenomena, and questions of nomothetic explanation, prediction and control. However, the study of teaching-learning as found in contemporary writings of researchers has increasingly detached itself from the experiential life-world of the 'concrete' instructional situation. In fact, the term 'experience' has acquired a new meaning. This change of meaning has come about as a result of the kind of research which increasingly has allied itself with the experimental method, rooted in the positivistic principles of the physical sciences. In educational theorizing the notion of 'experience' has become a somewhat discredited term. Educationists have argued that a teacher can plan instructional objectives and strategies but that a teacher cannot plan experiences. Experiences have been considered to be highly personal and therefore rather inaccessible dimensions of being. The scientific cybernetic thesis of instruction reduces the experiencing teacher and learner to an abstracted system characterized by states and behavioral fields, observed in terms of measurable inputs and outputs. Insight in instruction is thus understood as insight in the lawfulness of teaching-learning relations. This view leads to the following dilemma: If a researcher of instruction wishes to use the methodology of the natural sciences, then he may arrive at theoretical formulations of instructional phenomena that bear little relevance for the immediate existential reality of teaching-learning experiences. On the other hand, if a researcher chooses to study instruction 'from the inside,' i.e., phenomenologically, then he will be unable to produce the sort of nomothetic propositions that are characteristic of scientific theory.

The above dilemma is resolved, however, upon the recognition of the fact that cybernetics and phenomenology also stand in a complementary relation to each other, in the same sense as, for example, the "wave theory" and the "particle theory" of light are related. Each has its own domain of applicability. The point is that, as independent methodological orientations, cybernetics and phenomenology can make *different* contributions to the study of teaching-learning phenomena. It depends on the nature of the method of inquiry what kinds of questions one can ask in the study of teaching-learning. Every method has its own inherent potentialities and limitations with respect to the sorts of research problems in which one can engage. This usually means that once a researcher has acquired expertise in the use of a specific method of inquiry, he also has accepted a system of relevancies imposed by the nature of the problems which can be investigated by this methodology. That is, the researcher has accepted, in Schuetz's words, the relevancies imposed within his field as the intrinsic, and the only intrinsic relevancies of his acting and thinking.

For research in teaching-learning a topology of problems could be constructed which would match particular types of problems with specific methodologies, and within each methodology with specific techniques, for their solution.

For example, an heuristic problem of a nomothetic nature would require the application of the scientific method, but within this method one further has to determine whether the problem is concerned with specifically:

(1) the generation of scientific propositions (a retroductive or deductive problem);

(2) the formulation and testing of hypothesized relations among phenomena (an experimental design problem);

(3) the corroboration of existing propositions (an eclectic experimental problem);

(4) the discovery of general facts (an inductive problem), and

(5) the construction of a theoretic system for the explanation and prediction of specific phenomena (a logical problem), etc.

Other kinds of problems in education require a philosophical method for their solution. Contemporary philosophers have come to see philosophy as a methodological tool for analysis, criticism, evaluation and speculation. For example, philosophy is concerned with clarity and precision of language; it asks "What does it mean to say this?" and "What is the nature of this concept?" Philosophical examinations provide the investigator with a point of view and with a broader perspective.

Other problems again are of a practical or a pragmatic nature. These concern questions of technological efficiency, economy and the preparation of optimum conditions. Solution methods are found, for example, in theories of decision-making, and game theory. It was shown that Bruner considers instructional theorizing essentially prescriptive. According to Bruner instructional theory is concerned with how what one wishes to teach can best be learned, with improving rather than describing instructional processes.

Lately the social sciences have provided special methods and techniques for inquiry in teaching-learning processes. For example, L. M. Smith has applied the anthropological method of ethnography rather than using a statistical technique for gathering data of classroom events. In this study it has been suggested that the sociological technique of ethnomethodology could be used in collaboration with interaction analysis or as a technique for the phenomenological method.

In a sense this discussion is related to the issues referred to as 'theory *and* practice,' 'theory *versus* practice,' or theory *into* practice.' These issues become relevant, for example, when students appeal to their professor to deal in his course less with theoretical and more with practical knowledge. The tension between theory and practice can be grasped with the heuristic question concerning 'how a system operates,' and the pragmatic question of 'how a system can be made to operate.' In this sense one may say that theory and practice are merely the opposite sides of the same coin. Some people are more interested in gaining an 'understanding' of how a system operates while others are more concerned with gaining 'practical control' in operating the system. This distinction is found already in children: while one child simply cannot resist taking his toy apart in order to discover its inner secrets, another child seems perfectly content to play with his toys.

Teachers sometimes are given the choice of whether they wish to be considered 'professionals' or 'technicians' (that is, practitioners without theory with which to practise). But one may counter this proposition by pointing out that one does not always have to understand the workings of a system in order to be able to work with it. For example, the concept 'black box' refers to a system of which the inner workings are at best inferred from observations of input-output processes. One may have acquired a knowledge of generalized facts about a system that enables one to successfully perform certain operations. For example, most people know how to use a telephone but few people possess insight into the structure and the principles on the basis of which a telephone network operates. A car mechanic could be quite capable of repairing the common faults occurring in the cars he sees in his workshop while the same man may know next to nothing about the mechanical principles with which he is working. Similarly, some teachers, who have very little knowledge of educational theory, have developed a set of personal routines and practices which make them very effective in the classroom.

There is another problem related to the theory-practice issue. Contrary to the physical sciences where the researcher has the system 'isolated' and 'in front of him' as it were, the teacher who wishes to understand the instructional system knows that he himself is an integral part of that system. Therefore, understanding the instructional system means for a teacher understanding a system of which he himself is an essential part. In addition to this, it would seem that the classroom is such a complicated little world that the contingent factors of any particular event make it very difficult to determine which variables to include and which variables to exclude in the study of any particular classroom system. In a teaching-learning situation values, feelings, ideas, and suggestions are communicated by means of expositions, questions, answers, by means of glance and gesture, through perception of actions and through expressive accounts of what is subjectively experienced. All these forms of communicative exchange are inalienable elements of the teaching-learning process.

It is with reference to the above mentioned considerations that the desirability and necessity of cybernetic phenomenology as an approach in the study of instruction is defended on methodological grounds. The phenomenological method is capable of resolving questions which are raised within the domain of a unique experience-orientated methodology. The tension of theory and practice does not seem to become an issue. 'Theorizing' always functions on some level of abstraction while 'practice' relegates the abstraction to the solution of some technical problem. The experiential phenomenological orientation views teaching-learning as an aspect of the lived world of immediate experience. Since phenomenology employs an experience-based methodology it means that there is no issue of theory into practice or practice into theory. From the lengthy presentation in Chapter V it has become clear that cybernetic phenomenology cannot be expected to produce nomothetic propositions or to resolve questions that belong within the framework of scientific theory: questions of explanation, prediction and control. In contrast with scientific theory, the problem here is not to attribute instructional outcomes to objective causes but rather to articulate them within an experiential system or whole.

Cybernetic phenomenology is self-validating in the sense that it appeals to authenticity rather than factual truth. To the extent that the final chapter, "The Sorcerer's Apprentice" suffers from a lack of authenticity, it has failed to provide a proper description of the relationship master teacher-learner, at which the study was aimed.

This thesis has been of an exploratory rather than of a hypothetical nature. The conclusions to be drawn are therefore of a provisional rather than of a final nature. In many ways this study has scratched only the surface of things. However, in the course of this exploration I have come to feel that a further pursuing of the notion of an experience-orientated methodology in the study of teaching-learning is not only legitimate and worthwhile but also an interest-arousing venture. I am convinced that there is a place for an approach to the study of instruction which is based on the tenets that all knowledge of teaching-learning phenomena is founded in the lived world of immediate experience, that knowledge of instruction is in the appearance of a thing or process, not in the causal structures underlying it, and that all knowledge of teaching-learning phenomena is relative to the human condition and perspective.

Recommendations

Research and writing in the area of teaching-learning phenomena rarely have been done from the orientation of phenomenology or cybernetic phenomenology. The only kind of professional literature in education that at times has demonstrated certain alliances to the tradition of (existential) phenomenology is the so-called humanistic literature. The interest in 'humanistic education' in any particular school subject is rooted primarily in the protest against feelings of alienation and absurdity engendered by increasingly institutionalized teaching-learning processes. However, phenomenology as a method of inquiry is not necessarily committed to the 'calling' of protest or to the humanization of certain sectors of society. Particularly in France, phenomenology of late has moved in the direction of an association with the structuralism of, for example, a Claude Lévi-Strauss. Considering the above observations, a number of recommendations follow from this study:

(1) It is recommended that the epistemological implications of the cybernetic phenomenological method and of the phenomenological method in general, in the study of instruction, be further examined.

(2) It is recommended that the concept of an 'experience-based' orientation to the study of teaching-learning be further explored.

(3) It is recommended that the general thesis of the cybernetic systems approach as a theoretical framework for all teaching-learning phenomena be pursued further.

(4) It is recommended that the entire domain of applied phenomenological literature be searched for materials relevant for teaching-learning (and education in general).

(5) It is recommended that the phenomenon 'orientation' and the relational phenomenon 'the Sorcerer's Apprentice' be studied more extensively.

(6) It is recommended that a list be constructed of teaching-learning phenomena which are worthy of phenomenological research.

(7) It is recommended that projects be undertaken, each of some specific 'phenomenon' which involve a variety of techniques and

resources: research reports, novels, poetry, autobiographical literature, art work, and so on. Field data may be collected from observers and from participants of the teaching-learning process.

(8) It is recommended that the attempt be made to bring phenomenological studies to the attention of teachers.

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